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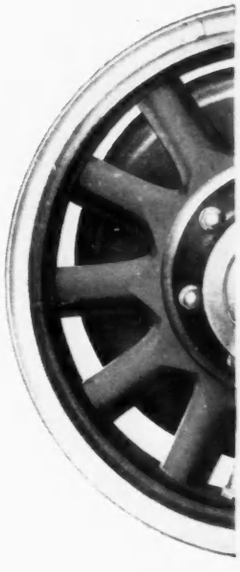

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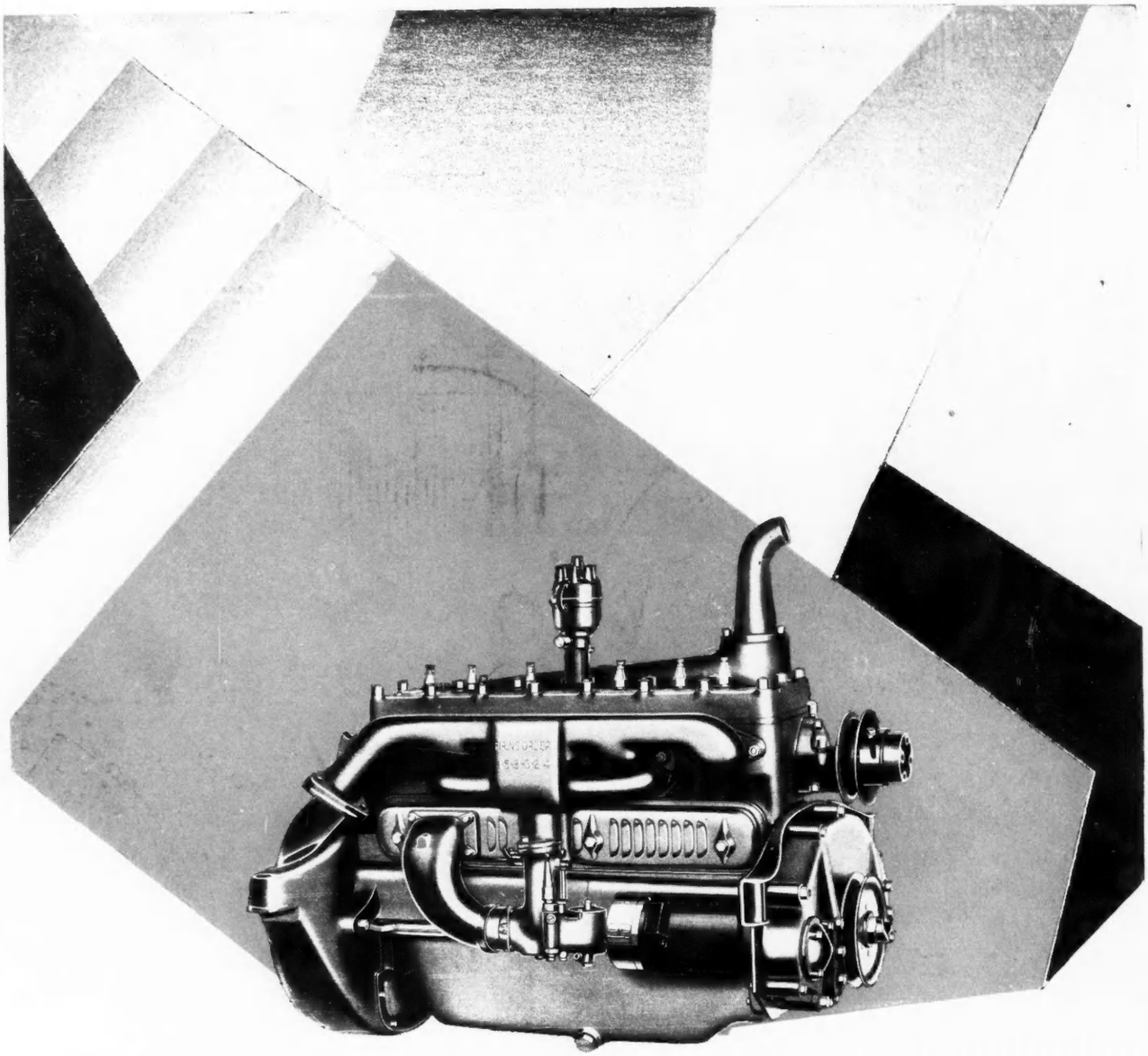

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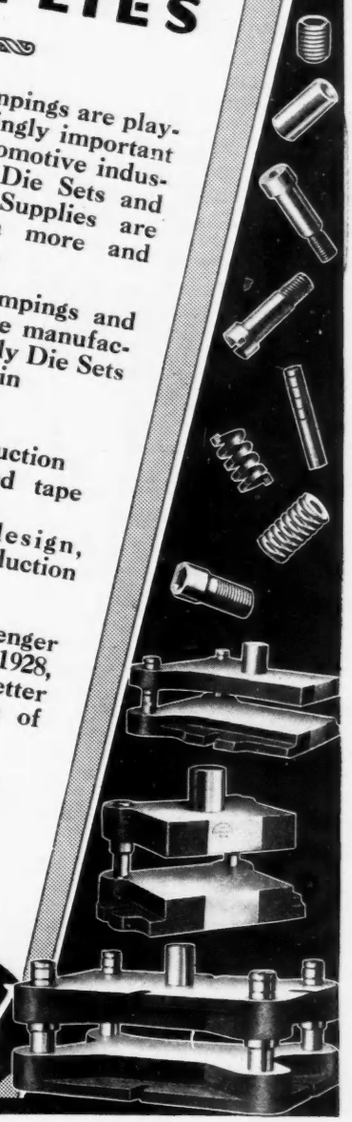

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AUTOMOTIVE INDUSTRIES
VOLUME 60 *Philadelphia, Saturday, April 20, 1929* NUMBER 16

Stability Likely in Car Prices for Next Six Months

General overstocking of dealers leading to price cuts improbable, leading executives believe. "Cheaper to cut production than prices," says one. First quarter changes many.

By **Norman G. Shidle**

PLENTY of changes have been made in passenger car prices since the first of January, 1929, but no definite trend upward or downward can be traced thus far. A majority of the important companies in the industry have revised lists in the last three and a half months, but the importance of the increases has been just as great as that of the cuts. What of the future?

The Ford increases on Model A, averaging around $30, while not trumpeted loudly in the general newspapers, unquestionably were the most interesting of the recent price rises as viewed by manufacturing executives within the industry. Lincoln prices, too, were raised on all except two models. Other increases of note since the first of the year include the advances on three Durant 40 models, on two Locomobile models, on the Willys-Knight 66A sedan, on two Chrysler Imperial models, on the Windsor 8-92 roadster, and on two Stutz Blackhawk L8's.

Equally important, however, were the price decreases registered in the same period. Widespread attention centered on the Packard cuts of approximately $150 when they were made a month or so ago, while more recently the Hupmobile decreases have been studied with interest by the industry. Other important cuts which were announced in the first quarter included those on the Stutz Blackhawks, both sixes and eights, on the Dodge Senior Six, on Peerless, on Plymouth, on a Durant 66 and on a Durant 70 model, on Moon, on three Reo models, and on the roadster and the cabriolet-coupe of the Willys-Knight 66A line.

Lack of any clearly defined price tendencies is evident. The accompanying complete tabulation of all price changes since Jan. 1, 1929, provides a basis for more detailed examination of what has taken place in recent months.

There is no evidence that any definite trends will exhibit themselves in the next six months. The record-breaking production of the first quarter has caused talk of overproduction and possibilities of subsequent downward price revisions. Examination of available data, however, in addition to informal talks with leading sales executives of more than a dozen important companies, provides no basis for predicting any such decline in prices.

Since price trends react strongly to the relation between dealer stocks and probable factory production, the status of dealers' car inventories may properly be the starting point of any price trend discussion.

Proceeding on that basis, there seems to be little chance of general or serious reductions either in list prices or in that actual selling price which is determined by the trade-in allowance made by the dealer on the used car.

A few makers have overstocked their dealers with new cars, it is true, but it is equally true that a majority of dealer organizations do not have uncomfortably large stocks of new cars on hand at this time. A few dealer organizations even are still crying for cars.

Ford unquestionably has increased his dealer stocks very materially over this time last year. While his retailers are short on certain models or in certain areas, most of them have reasonable stocks of cars on their floors. A year ago, their stocks were meager in most cases and almost entirely lacking in others. Thus Ford undoubtedly accounts for considerable of the increase in total dealer stocks over this time last year. A few makers in the middle or high-priced fields have accumulated heavier inventories than are comfortable, but there is no real indication of a general or seriously overstocked condition at present.

Watchfulness of prices by car company executives today applies, of course, primarily to list prices. Actual prices paid by the public have for a good many years varied quite closely with the volume of excess cars in dealers' hands. While list prices have held fairly steady

through several periods of over-production in recent years, added allowances made by dealers on trade-ins have been common in every such period, thus making it possible for the public to obtain cars at what amounts to cut prices during such times. Sometimes the factories have made possible these virtual price cuts through inside trading allowances, although in other cases mere need for working capital on the part of the retailer has been sufficient urge to bring heavy allowances.

With the new car stock situation generally sound at the moment, then, there is no reason to believe that excess trading will cut prices to any more marked extent during the next few months than at any other time. Stable list prices seem well assured, too.

And the attitude being taken by factory executives in general toward continued close correlation of production with the retail sales curve betokens the preservation of good balance within the industry as the second quarter goes forward.

"It's much cheaper to cut production than to cut prices," is the succinct summing up of the price outlook made by one important sales executive associated with a high-priced car manufacturing company. "The day has passed," he said, "when any large car maker should get caught in serious over-production. I look for a good business throughout 1929, but I believe that production in the last half of the year will be little if any in excess of 1928. The present quarter should be fairly large. We won't keep breaking records, and I don't believe many executives think we will."

"That being the case," he continued, "I see no reason to expect price cuts. In my opinion they would benefit nobody and would harm nearly everybody.

This executive is quoted at some length, both because of his prominence and because he expressed views which are typical of a number of leading sales managers with whom the same subject was discussed recently. While practically all of the men interviewed agreed that there is a very direct relation between production quantities and prices, they were unanimous in believing that production schedules would be held down to totals indicated as reasonable by actual retail sales figures and that price stability was assured as a result.

"I don't see anything to worry about as regards overproduction, so long as we manufacturers just use common-sense," said another sales executive associated with a big quantity production factory. "We are increasing our April schedules over March, and our sales figures fully justify that increase."

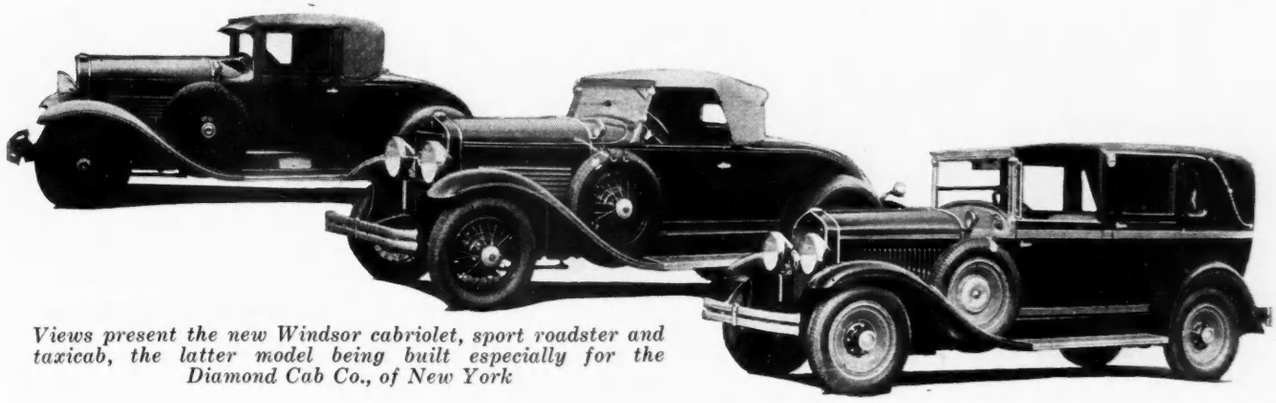
"Even should we build the same or fewer cars in the last six months this year than in the last six months of 1928, we would have good cause for optimism. It would be a sign of good sense and growing stability."

Price Changes Announced Since January 1, 1929

Make and Model	New Price	Old Price
BLACKHAWK L6		
Speedster, 4-p.	$2,535	$2,635
Speedster, 4-p.	2,735	2,885
Coupe	2,495	2,695
Sedan	2,395	2,695
Chantilly	2,595	2,895
Monaco	2,655	2,955
Deauville	2,655	2,955
Cabriolet	2,590	2,595
BLACKHAWK L8		
Speedster, 2-p.	2,535	2,485
Speedster, 4-p.	2,535	2,585
Speedster, 4-p.	2,735	2,835
Coupe 5-p.	2,395	2,345
Coupe 2-p.	2,495	2,545
Cabriolet	2,590	2,545
Sedan	2,395	2,645
Chantilly	2,595	2,845
Monaco	2,655	2,905
Deauville	2,655	2,905
BUICK 129		
CC Sedan	1,875	1,865
CHRYSLER IMP. 80		
Sport Phaeton	3,855	2,675
Sedan, 7-p.	3,095	3,075
DODGE BROS. Sr. 6		
Roadster	1,565	1,695
Coupe, 2-p.	1,545	1,675
Sedan, 4-d.	1,545	1,675
Landau Sedan	1,595	1,845
DURANT 40		
Sedan, 2-d.	625	595
Sedan, DeL.	815	775
DeL. Roadster	715	675
DURANT 60		
Sport Roadster	685	755
DeL. Roadster	810	845
Coupe	685	755
Sedan, 2-d.	695	765
Sedan, 4-d.	750	845
DeL. Cabriolet	875	895
DURANT 66		
Coupe	895	975
DURANT 70		
Sedan	1,285	1,385
FORD A		
Roadster	485	450–385
Bus. Coupe	525	495
Tudor Sedan	525	495
Phaeton	460	395
HUPMOBILE A		
Sportster	1,390	1,435
Phaeton, 5-p.	1,410	1,425
Phaeton, 7-p.	1,420	1,455
Cabriolet	1,385	1,475
Sedan, 2-d.	1,245	1,345
Sedan, 4-d.	1,350	1,395
Coupe	1,360	1,385
HUPMOBILE M		
Sportster	1,725	1,915
Phaeton, 5-p.	1,755	1,905
Phaeton, 7-p.	1,785	1,935
Cabriolet	1,755	1,955
Sedan, 2-d.	1,755	1,825
Coupe	1,770	1,865
Sedan	1,815	1,875
LINCOLN 8		
Spt. Roadster	4,650	4,600
Club Roadster	4,900	4,600
Spt. Touring	4,650	4,600
Spt. Phaeton	4,650	4,600
Coupe	4,800	4,600
Sedan, 4-p.	4,900	4,800
Sedan, 5-p.	5,000	4,800
Coupe, 2-p.	5,200	5,000
Sedan, 7-p.	5,100	5,000
Limousine	5,300	5,200
Berline	5,800	5,500
Limousine	6,200	6,000
Brougham	6,600	6,500
Berl. Landau	6,100	6,500
Cabriolet	6,700	6,600
Le Baron Cab.	7,100	7,000
Holbrook Cab.	6,800	7,200
Collap. Cab.	7,400	7,300
LOCOMOBILE 88		
Sedan, 7-p.	3,750	3,350
A.W. Cab.	7,500	7,200
MOON 6-72 Royal		
Sedan	1,495	1,595
Petite Sedan	1,495	1,595
Vic. Coupe	1,495	1,695
PACKARD 6-26		
Sedan	2,275	2,435
Coupe	2,350	2,510
Conv't Coupe	2,425	2,585
PACKARD 6-33		
Runabout	2,375	2,535
Phaeton	2,375	2,535
Touring	2,475	2,635
Coupe	2,575	2,735
Club Sedan	2,575	2,735
Sedan	2,575	2,735
Sedan Lim.	2,675	2,835
PEERLESS 125		
Roadster	2,195	2,245
Coupe	2,195	2,345
Sedan, 5-p.	2,195	2,345
Sedan, 7-p.	2,295	2,545
PLYMOUTH		
Coupe	655	685
Sedan, 2-d.	675	700
Sedan, 4-d.	695	735
DeL. Coupe	695	735
REO C Flying Cloud		
Sport Coupe	1,750	1,625
Brougham	1,595	1,645
Victoria	1,695	1,795
Sedan, 4-d.	1,745	1,845
WILLYS-KNIGHT 66A		
Roadster	1,850	1,895
Coupe Cab.	1,850	1,895
Sedan	1,995	1,895
WINDSOR 8-92		
Roadster	1,945	1,895

Companion Line to White Prince Being Produced by Windsor

New Model 6-77 has four-speed forward transmission and resembles its predecessor, which was introduced at the New York Show



Views present the new Windsor cabriolet, sport roadster and taxicab, the latter model being built especially for the Diamond Cab Co., of New York

As a companion line to the Windsor White Prince, the Windsor Corporation of St. Louis has in production a six-cylinder series of automobiles with four-speed forward transmissions, to be known as the Windsor 6-77, President C. W. Burst has announced.

The new series 6-77 resembles very closely in style and appearance the White Prince eight, introduced at the last New York show. Line treatment and interior and exterior finish are almost exact replicas.

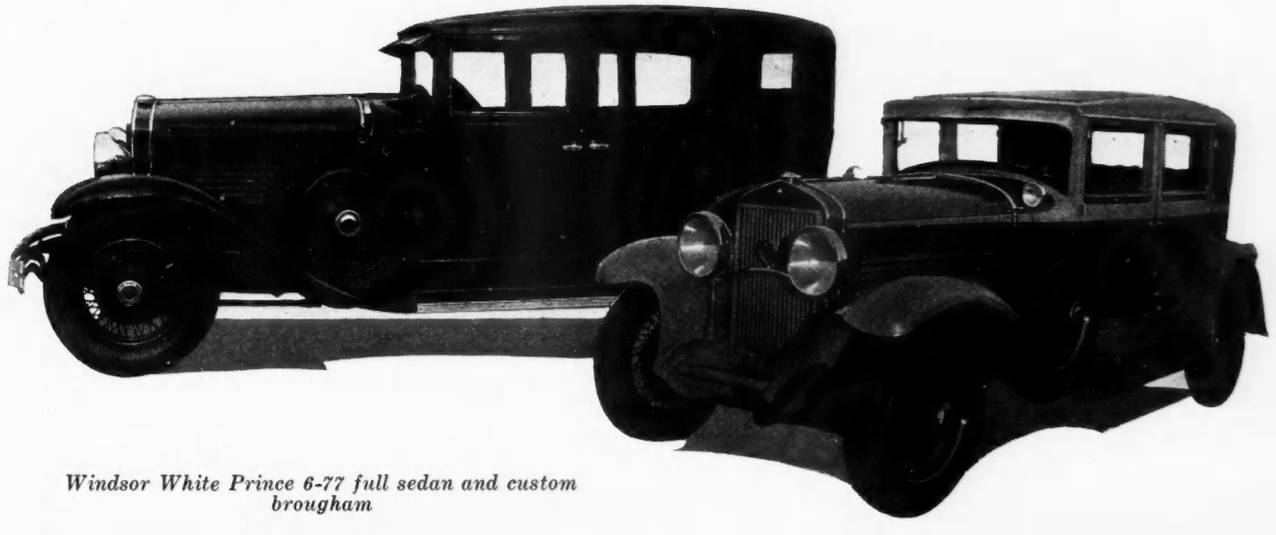
The car is built on the same 120-in. wheelbase as the Moon 6-72, recently restyled the Windsor 6-72, the addition of a four-speed Warner transmission, Model T5, being the only principal change. The same Continental 11E engine that powers the 6-72 is used in the new 6-77.

The Continental 11E engine has a 3⅜ by 4 in. bore and stroke. The detachable cylinder head is of cast gray iron material. The S. A. E. horsepower rating is 27.3 and the engine develops 66 h.p. at 3150 r.p.m. A Lanchester type dampener is standard equipment and insures smoothness and flexibility. Aluminum Alloy-Nelson type pistons are furnished. It has a seven-bearing crankshaft of selected S. A. E. No. 1045 forged steel, double heat treated. Delco-Remy ignition, starting and lighting system, and starting switch are used on the new models.

Prices of the 6-77 are as follows:

Roadster	$1,545
Cabriolet	1,565
Custom Brougham	1,565
Victoria Coupe	1,565
5-Pass. Sedan	1,565
7-Pass. Sedan	1,895

The seven-passenger sedan is a new addition to the Moon and Windsor lines and is mounted on a wheelbase of 132 in., the only change in important specifications.



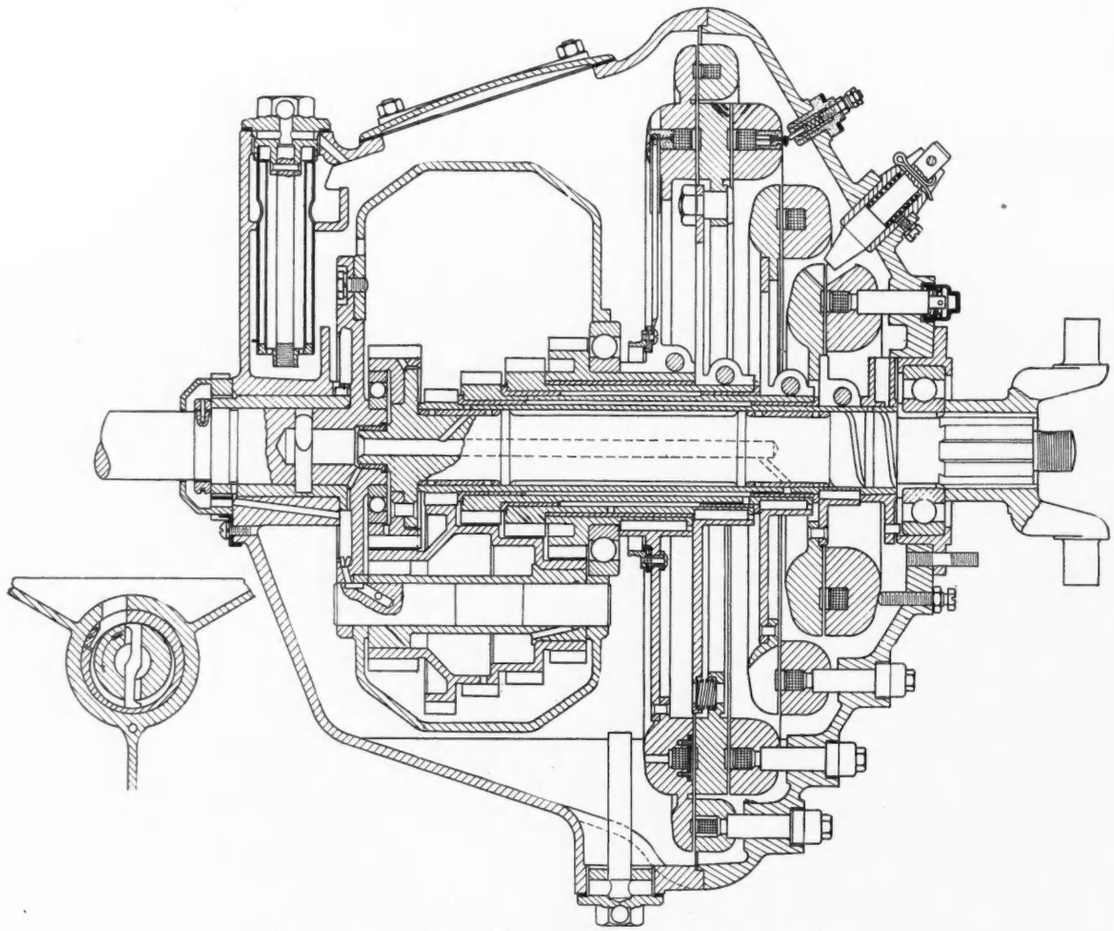
Windsor White Prince 6-77 full sedan and custom brougham

Planetary-Magnetic *Transmission Satisfactory* in Bus Tests

Observation of Paris vehicle using the gear shift without declutching indicates increased average speed and gasoline economy.

TWO Paris buses equipped with the Cotal planetary-magnetic, four-speed gear shift have been in constant service for the last six months, and an order has just been placed for 10 more. In Berlin, 10 buses have been running with this transmission for the last eight months and orders have been placed with the N. A. G. (Nationale Automobil-Gesellschaft), which holds the patent rights for German territory, for an additional thirty.

transmission showed that the number of gearshifts averaged 200 per hour. The bus, which ran between the Paris Opera House and the Porte d'Orleans, although sometimes put on other routes, weighed 5½ tons empty and 8 tons when carrying a capacity number of passengers totalling 38 without the driver and the conductor. The journey over this route occupied 29 min. 3 sec., during which there were 96 gear shifts, either up or down, each movement of the lever being



Section through Cotal four-speed planetary transmission

The Cotal transmission is a planetary type with magnetic control, the current used being taken from the car lighting and starting battery. It gives finger tip control, with shifts either up or down without declutching. The clutch is used only when engaging any speed from neutral.

Observations of one of the Paris buses using this

counted as one shift. Except by watching the driver, it was impossible to know when a gear shift had taken place, and the bus was equally silent whatever gear was in engagement.

Most of the 1500 buses in service in Paris have a three-speed, straight-through gear shift. Drivers are encouraged to start on second and pass into high, the

bottom gear being used only for starting on gradients. This plan is adopted because of the lack of skill of drivers, who shift gears mechanically without any attention to the manner in which the engine is pulling.

The driver of the bus with the Cotal transmission was no better than the average, and failed to get the best out of his bus. There was the advantage, however, of greater flexibility and the absence of shocks. Because of unskilled handling and the large number of gear shifts, averaging more than 2000 per day per bus, the ordinary sliding gear transmission is expensive to maintain. The two Cotal transmissions under test have received no attention for the six months they have been in the hands of various drivers. The current consumption is 2 to 3 amperes, which is insignificant compared with the 11 and 12 amperes required for lighting. These buses do not have electric starting.

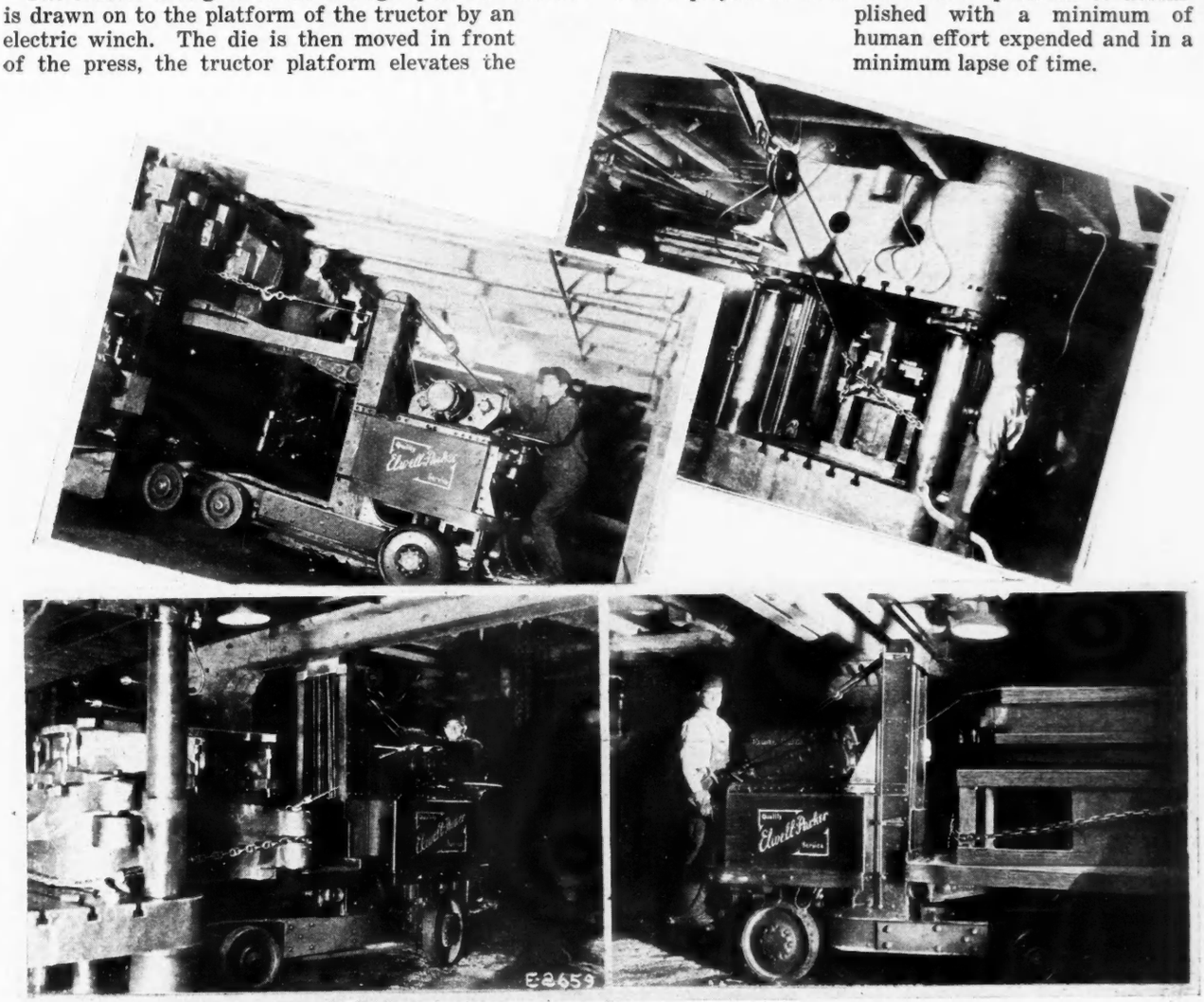
Road tests carried out by the engineers of the Paris Omnibus Company with two identical buses weighing 8½ tons each, one having a three-speed sliding transmission and the other a four-speed planetary-magnetic Cotal, showed an increase in average speed of 4.35 per cent in favor of the Cotal and an economy of 9.15 per cent in gasoline consumption.

Handling Large Dies on Elwell-Parker Trucks

HANDLING of the large dies used in automotive work is an unusually difficult problem, not only because of the great weight which many of these dies attain, but also because of the speed with which they must be moved in order to keep the presses in operation. One effective method of handling dies is shown in the accompanying illustrations where a storage driven tier-tructor, built by the Elwell-Parker Electric Co., Cleveland, is being used in moving a 10-ton die.

The tructor first goes to the storage space and the die is drawn on to the platform of the tructor by an electric winch. The die is then moved in front of the press, the tructor platform elevates the 10-ton load to the level of the press platform and a heavy winch cable is thrown over the die and passed over the pulley in a split snatch block anchored to the ceiling on the far side of the press. The cable hook is returned and attached to a heavy chain thrown around the die. Then, as the tructor electric winch winds in the cable, the die is slid into position on the press.

In removing the die from the press, the same methods are employed so that the entire operation is accomplished with a minimum of human effort expended and in a minimum lapse of time.



(Top left)—Removing die from storage shelf. (Top right)—Removing die from truck platform. (Lower left)—Die sliding off press. (Lower right)—Die sliding off platform

Opportunity for American Cars in Governed by *Low-Priced* Models

Lower per capita wealth, local prejudice and habits as well as restrictive carrier legislation limit volume of distribution.

By Walton E. Schmidt

PEOPLE everywhere want motor cars and they are among the first articles to be purchased when there are funds available above the amount necessary for obtaining the necessities of existence. This fact has been strikingly brought home by Walton E. Schmidt, field representative of the National Automobile Chamber of Commerce, after a year's work in the Far East covering Japan, China, Manchuria, the Philippine Islands, Singapore, Java, Australia and New Zealand, attempting to give interested people in those countries a comprehensive picture of American methods of transport regulation and taxation.

In the Far East, road-building is progressing rapidly and the existing routes are being improved. China, for example, has 18,000 miles of roads adapted to motor travel, and Japan is launching a national road-building program which will include a highway from one end of the main island to the other within the next 10 years. Where government aid is not available, in some countries, private capital is undertaking the job of road building.

Eighty to 90 per cent of the motor vehicles sold in the Far East go into the public conveyance service as taxis or buses. Police officials are requiring a better type of equipment for this service as a matter of safety, and most of the second hand vehicles now in this service will be scrapped in favor of new cars, which should stimulate sales. Iron wheeled motor trucks are being ruled off the roads because of their destructive qualities, opening up a market for new trucks.

Without attempting anything like a statistical report of conditions in the countries visited, the following paragraphs will present some of the high spots in foreign automobile markets.

In Australia and New Zealand, the development of bus and common carrier truck transportation is hindered by the fact that they are competing with the railroads and the latter, being government properties, are influential in promoting legislation restricting the development of common carrier transportation and in obstructing legislation designed to help its progress.

Another disturbing feature of Australian legislation is the effort to grant preferential taxation for British vehicles. While measures of this sort have not had any great success so far, they are constantly being introduced in the state parliaments and it is likely that some of them will get through.

British manufacturers have recently increased discounts to Australian dealers and American manufacturers may expect requests for increased discounts, although American discounts have always been greater than those granted by British makers.

Low-priced cars are supreme in the Australian market and no cars beyond the $1,200 price class, of any make, are selling in quantities. In connection with new models, stress should be laid on lower gasoline consumption and greater mileage, as these factors are being emphasized by European competitors.

The Australian automobile industry has doubled its production in the last four years but profits have not kept the pace. Australian motor car dealers report that

Traffic control in the Far East made necessary by increasing motor use

MUCH of the field work of the National Automobile Chamber of Commerce is carried on at the invitation of interested societies and individuals in foreign countries which are eager to know about American methods of handling automobile problems. Walton E. Schmidt, a field representative of the Chamber, has just returned from a year's work in the Far East and Australasia. During the year he delivered 58 illustrated lectures before more than 25,000 people. Without the cooperation of local and automobile bodies it would not have been possible for him to have had so wide a hearing. Some of Mr. Schmidt's conclusions are presented in this article and should be of interest to export managers and others who are responsible for the development of foreign automobile markets.

Australasian Markets

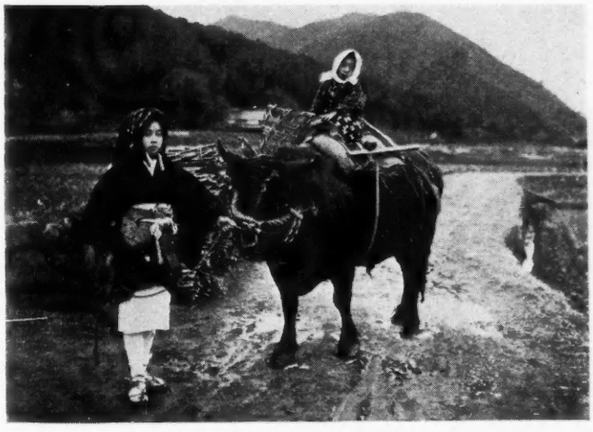
profits are the lowest on record. They oppose "force pump" methods developed at the expense of profits. Hard selling and the fight for business in excess of normal requirements has been largely responsible for this condition.

The discount on a completed car gives a definite but insufficient unit profit. Due to the tariff the distributor has only the chassis discount definitely set. His margin of profit on the coachwork, tires, batteries and other component parts which go to make up the total floor cost is a source of leakage of net earnings. To reach a price, fair margins have been sacrificed in the hope that larger sales would bring about the necessary total of profits. It is now claimed that Australia has a normal rate of motor vehicle absorption, provided that the cars available can be marketed at a reasonable cost, and beyond which sales costs are so high that profits are eliminated for the complete turnover.

A picture of one of many receptions received by Mr. Schmidt during his tour of Japan

Prospects in Australia are not bright, on the whole, due to the continuance of strikes in various lines of industry, coupled with the dissatisfaction of the dealers due to low profits. In New Zealand, on the other hand, a depression period has been weathered and sales of automobiles are breaking all records.

Far Eastern dealers say the coming of the low-priced car has considerably slowed up the sale of used cars. There is a preference for a new low-priced car rather than a used car, no matter how good it may be. New cars are often sold for a very small down payment or no down payment at all. Time to pay has been extended, in many cases, from 18 months to two years. Many of the sales are to natives, those who operate the vehicles for hire, sleeping in the car when it is not in use. Police departments are tightening the restrictions on such vehicles and it is probable that many of the operators will be refused licenses, with the resultant possibility that payment for the vehicles may never be completed.



A means of transportation that is fast disappearing in the Far East

Far Eastern dealers often complain that American factories pay insufficient attention to local requirements, or even to the wishes of the dealer. Many of them complain about the late arrival of shipping documents which, with the restrictions of the customs, puts them to needless expense and delay. They ask that the factories keep them informed more closely as to progress in the filling of cabled orders.

Specifications founded on local prejudice, such as leather upholstery in tropical countries, are often disregarded. Closer inspection of cars leaving foreign assembly plants is urged by certain dealers. Others complain that the number of replacement parts they are required to stock is expensive.

Japanese dealers and distributors asked that American manufacturers should investigate conditions before taking away dealerships from Japanese who have pioneered in the business. It is claimed that Japanese capitalists, particularly the great mercantile firms, are realizing the attractiveness of the automobile business and are making offers of increased sales to American automobile manufacturers if the latter will desert their present dealers and give the franchise to the larger organizations already engaged in other lines of merchandising. Some of the smaller dealers live in constant fear of the large firms which seek to absorb motor car distribution as they have other profitable lines.

Japanese commercial and political leaders expressed themselves as believing that American automobile manufacturers building plants in Japan should make stock available to Japanese investors while retaining control of the business for themselves. There is a general belief that the Japanese are entiled to share in the profits made by the companies supplying American automobiles to Japan.

In conclusion, it may be said that for the immediate future the automobile market in the Far East, and Oceania, is preeminently an opportunity for the makers of low-priced cars. Marketing conditions are more closely related to economic conditions than they are in this country, and the index of per capita wealth is not so high. Supplementary obstacles, in the way of local prejudices and restrictive legislation, must be broken down by concerted missionary work on the part of the manufacturers of American motor vehicles, if they expect to sell their product in the East.

Troublesome Vibration in Motor By the Industry's Engineers

Sources of the evil and progress toward its elimination are discussed with the Pennsylvania Section, S. A. E., by Thomas J. Litle, Jr., chief engineer of Marmon

IN discussing "Vibration in Motor Vehicles" before the Pennsylvania Section of the S. A. E. recently, Thomas J. Litle, Jr., chief engineer of the Marmon Motor Car Co., divided it into two parts; namely, the determination and control of vibration at its source, and the insolation, or control, of transmitted vibration. The inherent out-of-balance of the engine is by far the greatest cause of vibration that can be eliminated at the source, he said, and is responsible for most of the vibration troubles that perplex automobile engineers.

To neutralize the unbalanced forces in four-cylinder engines, he continued, Lanchester in England developed an anti-vibrator which was used on the last four-cylinder model of Willys-Knight car, and Vauxhall in England produced an engine in which weights were attached to the connecting rod bearing caps, which brought the center of gravity of the rod close to the crankpin, making the whole of the connecting rod weight rotating weight, so it could be conterbalanced by masses secured to the crank-arms. This method, however, did not take care of reciprocations of the pistons. Mr. Litle expressed the opinion that a small six costs less to manufacture than a four of equal power with a balancing device.

In a six-cylinder engine, there are no unbalanced forces due to reciprocating parts, he explained, but in the early 90 deg. V engines there was a serious out-of-balance in the horizontal plane which manifested itself particularly when driving a car equipped with such an engine at high speed. That property became quite serious when developing an eight-cylinder aircraft engine during the war period, and this engine was never put in production, the 12-cylinder 60 deg. V type being chosen instead for the Liberty aircraft engine. The most effective way of eliminating unbalanced forces in eight-cylinder 90 deg. V engines is by the use of crankshafts with cranks at 90 deg. and counter-weights. Mr. Litle said it was his impression that this construction was first used by the Wright Aeronautical Corporation in connection with the development of their Hispano engine during the latter part of the war.

In the 60 deg. V eight, the unbalanced force still exists, the horizontal component being much reduced and the vertical component increased, but there is no known method of reducing it by counter-balancing. The nearest approach to perfect mechanical balance is found in the straight-eight type of engine.

With the introduction of the six-cylinder engine, with its longer crankshaft and more frequent power impulses, the natural frequency of vibration of the crankshaft often coincides with the frequency of impulses well within the driving range. The same condition occurs in aggravated form in the straight-eight type of engine. To check such vibration, a damper is needed. The first device of this kind was developed by Lanchester in England and consists of a flywheel on the forward end of the crankshaft, mounted thereon between friction disks. The most recent development along this line consists in the use of a light disk, cushioned in rubber, and mounted at the forward end of the crankshaft. This "modulator," as it is called, is an invention of Mr. Litle's. In action, it vibrates at high frequency, and by reason of the plastic friction of the rubber mounting it suppresses crankshaft vibration in the incipient stage. On engines of from 175 to 216 cu. in. displacement, a steel disk 8½ in. in diameter, stamped from ¼ in. stock, is used. It is driven by rubber buttons and must not be restrained too much by clamping.

Another cause of

OUR epitome of Mr. Litle's discussion:

Inherent out-of-balance in the engine is the most important source of periodic vibration. Second to it is torque reaction. Other noteworthy sources include the clutch, the transmission, the propeller shaft and universal joints, the rear axle assembly and rough, anti-skid types of tire treads. There is a form of vibration due to the roughness of modern high-compression engines.

The use of rubber to prevent the transmission of vibration will be modified by a trend away from solid blocks toward hollow devices and later pneumatic chamber appliances patterned after the modern tire.

Rubber-mounted wheel hubs have been proposed as a meaans of further reducing road shock.

A rubber-mounted engine fan functions as a vibration damper for the engine.

Attention of inventors is called to the desirability of eliminating practically all the small mechanical joints in the braking system, control rods for the throttle, spark and cowl ventilators, as well as in shackles, body hardware and hood hinges.

Excessive powerplant weight, which is a contributing factor to vibration, could be eliminated by aluminum construction, if the cost of that metal were not prohibitive. Had Henry Ford been given control of Muscle Shoals, he probably would have used considerable of the cheap power available for producing aluminum.

Vehicles is Being Subdued

vibration is non-uniformity of the torque reaction, which decreases with an increase in the number of cylinders.

Passing on to the transmission units, the clutch may transmit torsional vibration from the engine, and to prevent this, the driven member is usually provided with damping devices in the form of rubberized fabric inserts or friction plates. Vibrations may originate also in the transmission, if the gears are cut or meshed improperly, and vibrations from the crankshaft may be made audible in the form of gear clatter. There is no really satisfactory method of taking care of this in the transmission itself, although the use of heavier gear blanks might help, as they would not respond so readily to vibration.

Owing to the high engine speeds currently used, perfect balance of the propeller shaft and universal joints is important. Stiff tubular shafts must be used, which will not deflect easily.

In the rear axle, the pinion and gear are a possible source of vibration, but this is largely controlled by careful manufacture. Finally, certain types of anti-skid tires with treads consisting of a series of lumps or projections, deserve consideration as possible causes of vibration. Mr. Litle said he knew of a case where a manufacturer was having an epidemic of supposedly noisy axles, when the actual cause was the rough tread on the tire used. The action might be compared with that of rolling a spur gear over a table. Noise from this cause is particularly noticeable in the case of closed cars, where it appears in the form of a low-period rumble.

In addition to the different forms of periodic vibration discussed, roughness of action of modern high-speed engines also gives rise to vibration. This roughness really arises from two sources. In the first place, there may be a very sharp peak to the explosion pressure, and, secondly, the engine structure may be deformed or deflected mechanically. The crankcase really functions as a beam, and a barrel-type crankcase would give better results than certain of the flat-surfaced designs now in use.

From the engine, the vibration is transmitted to the frame and the body of the car. Considerable work has been done in recent years in the way of insulating or cushioning the engine supports. Such mountings may be divided into three classes as follows:

1. The Rolls-Royce type, using links and friction shock absorbers.
2. Spring mountings, probably first used in this country on the Maxwell.
3. Rubber mountings.

Efforts have been made to insulate the body from the frame by making it an independent structure and mounting it on rubber or springs, a practice probably originated by the British Daimler Company. The rubber shock insulator used on the ends of chassis springs performs two valuable functions, in that it prevents the transmission of vibration from the road to the main structure, and eliminates the metal shackles which are subject to wear and side play. While the use of rubber to prevent the transmission of vibration is becoming quite common in the industry, Mr. Litle made the prediction that a development similar to that in rubber tires would take place, and that the present solid rubber blocks would be replaced by hollow rubber cushions and eventually by pneumatic chambers. Rubber, the speaker said, is a very peculiar substance, the physical properties of which are not well understood by engineers. Its life is actually increased by working it, provided, of course, it is not stressed beyond a reasonable limit.

Thomas J. Litle, chief engineer of Marmon Motor Car Co., who addressed the recent meeting of the Pennsylvania Section of the S.A.E. on "Vibration in Motor Vehicles"

At this point of his discourse, Mr. Litle injected a few remarks concerning the advantages which would accrue to the industry and the motor-vehicle-using public if aluminum were available at lower prices. The aircraft engineer has indicated the way to obtain reduced weight by using duralumin and other light alloys responsive to heat treatment, in place of steel. If commercial considerations permitted of the extensive use of aluminum in such parts as the crankcase, connecting rods, cylinder heads, oil pan, fan, front-end gear covers, transmission cases, etc., a very light powerplant could be produced. Aluminum has been used in a limited way in body manufacture, and Marmon at one time used it for fenders. Bodies could be made completely of aluminum, as could fenders, hoods, dust shields and disk wheels, but the price of the metal is prohibitive. Such extensive use of aluminum would greatly reduce the weight of the complete car and make it possible to mount an engine of smaller displacement, which would operate more smoothly and cause less vibration.

There are many possibilities for the use of rubber

and springs for the elimination of vibration in motor vehicles. In Germany, rubber air bags and air dashpots have been used successfully for the suspension of vehicles. Rubber-mounted wheel hubs have been proposed. Hose-pipe-type of driving members for accessories, such as generators and water pumps, have wide application and have replaced largely such mechanical drive members as Oldham couplings and spring-drive couplings. One company is using a rubber-mounted engine fan, which, besides being quieter than the ordinary fan, functions as a vibration damper for the engine. Rubber-insulated joints have been applied successfully to the steering gear, and rubber has been used to insulate the support of the steering gear on the body, a practice first introduced by Bugatti in France. A further method of reducing the transmission of vibration to the driver's arms, in the form of wheel fight, consists in loading the steering wheel rim with lead to increase its moment of inertia. Marmon some years ago used friction-type shock absorbers to damp out vibration in the steering mechanism.

Rubber Joints Desirable

Mr. Litle suggested that there were great opportunities for inventors in the way of replacing the metal joints in the various linkages by joints of rubber or impregnated fabric. Mechanical joints often are either too tight or too loose, in which latter case they produce annoying rattle. Most of these joints are difficult to lubricate, which makes the use of rubber joints the more desirable. The joints, of course, must be of such type as not to disturb the geometry of the hook-up.

When the engine of a car is running, particularly at certain definite speeds, the frame side rails vibrate much like violin strings. At certain points along the frame, the vibration is very pronounced. These points, known as anti-nodes, can be determined by placing a beaker with gasoline on the top flange of the side rail. At the anti-nodes, the gasoline will be set into violent vibration, and drops may be projected into the air several inches. By moving the beaker along the frame rail, other points, known as nodal points, will be found at which there is practically no vibration. Evidently the nodal points are the proper locations for the body bolts.

In exploring for vibration points, an instrument known as a reed tachometer is very useful. It consists of a number of flat springs or reeds mounted vertically on a frame or block, each surmounted by a small weight. The reeds are calibrated and by simply placing the instrument on a vibrating body and noting which reed or reeds vibrate, the period of vibration of the structure can be determined. It has been found that on the crankcase also there are certain points of vibration, or anti-nodes, and these are not suitable locations for engine supports.

Connecting rods when designed to carry merely the load due to the explosion pressure sometimes are not sufficiently rigid. In one case, a rod designed to leave a clearance of 1/32 in. between it and the wall of the cylinder at the lower end, gave trouble from interference in production engines, although the experimental engines had shown no such trouble. The clearance allowed evidently was too small, and it was necessary to machine slots in the lower end of the cylinder.

Chains used for front-end drives may be the cause of considerable vibration. They should be as short as possible and made in light sections of great strength. The less load they are required to transmit, the lighter the chains can be made, and the smoother will be their operation.

The metal inside side panels of composite or all-metal bodies have been coated with an asphaltum and also with a composition of hair and binding material to damp out vibration and rumbling in closed bodies. Some of the higher-priced automobiles, Mr. Litle, said, are now very easy-riding and quiet in operation, and he predicted that within a few years practically all cars manufactured will have the same desirable qualities.

In the discussion following the reading of the paper, the subject of cushion springs was introduced. Wm. J. Mayer of the J. G. Brill Company said there seemed to be no standard as regards the gage of wire and number of turns required in cushion springs, especially for buses. There also is very little literature on the subject. Sometimes a No. 10 wire is used, and if that does not prove satisfactory, a change is made to No. 11 wire and a slightly different number of turns. With the lighter spring, a heavy man may hit bottom and then there would be a complaint, and if the springs were made heavier there would be complaints from light persons that they were too stiff. Mr. Mayer thought the spring suspension of the bus had considerable to do with the seat cushion requirements.

Mr. Litle said that his company now makes it a practice to furnish the spring makers a rate curve to which they must work. In testing a cushion, a board was placed on top of it and pressure was exerted on the board by a drill press or other convenient means through a scale, and for each pressure the cushion must show a definite deflection.

Another speaker said that air-lock cushions had practically solved the bus seat cushion problem. Most buses have leather upholstery and the leather covering of the seat cushion forms an air bag with a flap valve which is closed when the body rebounds. The air then can escape only very slowly, and bottoming is prevented during sudden severe rebounds, while at the same time the seat will absorb more gradual up-and-down motions of considerable magnitude.

Spring Suspension Test

John Warren Watson said that he had tested the spring suspensions of numerous cars by observing the rate of vibration of the front and rear ends when carrying the weight of a normal sized man. He had found that there was no uniformity with respect to this factor. A rate of 105 to 110 per minute had been found very satisfactory for front ends, and 75 to 80 per minute for rear ends.

The subject of squeaky brakes also was brought up, these being another manifestation of vibration in chassis parts. Mr. Watson said he had been experimenting with the rubber-base material used in his shock absorbers, for brake linings. It is generally agreed that squeaking of brakes is due to alternate grabbing and slipping of the brakes, setting the brake structure into vibration. With the rubber flow lining there is a thin layer of plastic substance on the surface of the lining, which prevents grabbing, and therefore squeaking. This plastic material wears out in the course of time. Then the matrix of the material comes in contact with the metal drum once more and another set of pores are opened, releasing new plastic material. The lining, he said, was not yet on the market.

TWO papers on metal spars for airplanes have been published recently by the Air Corps in its Air Corps Information Circular. The first of these, No. 621, is "Design of Trussed Metal Spars for Single Bay Airplanes," by E. C. Fried, the second, No. 622, is "Tests on 6¼-In. Metal Spars," by A. S. Niles, Jr.

Just Among Ourselves

Scientific Papers Can be Interesting!

A PAPER read before a technical society properly can have only two functions, as we see it; namely, to inform or to stimulate thought. Some papers do neither; most of them inform, and a few both stimulate and inform. And these few are rare and fine things. The Pennsylvania Section of the S.A.E. was treated to one of these rare, fine papers last week when Thomas J. Litle, Jr., talked in Philadelphia on "Vibration in Motor Vehicles." In that talk, Marmon's chief engineer spoke frankly, intimately and speculatively. He was comprehensive without being encyclopedic, forward looking without being bizarre. He interested those in his audience while he talked and sent them home with plenty of things to think and talk about among themselves. Discussion that followed the paper inevitably was keen and spontaneous. While any talk of this kind loses much when conveyed through the medium of type, we think most readers will find reasonably interesting the report of this particular meeting which appears on other pages of this issue.

* * *

Independence Has Become Interdependence

A CASUAL statement which Mr. Litle injected about the dependence of car engineers today on the specialized engineering experts of parts and supply companies seemed especially significant. The day of the Jack-of-all-trades, he said, is pretty well passed. The engineer of a passenger car company today, he said, relies very heavily on the engineers of his supply sources to help him in the solution of special problems relating to their units. And he usually gets the kind of help he needs, according to Mr. Litle. He paid a high tribute to the brilliance and ability of many of the technical men in the parts companies. His statement simply emphasizes the value of the service which has become a regular part of the marketing activity of parts and accessory makers in recent years. Their customers' problems have been made their problems. Many engineering advances which reach the public through incorporation in a given automobile have had their genesis perhaps in the minds of the car engineers, but their achievement in the work of parts company technologists called in to solve special and difficult problems . . . Again laying stress on the mutual interpendence of the various units of this world's largest manufacturing industry.

* * *

Sales Promotion Defined by Grant

HOW many of us have clearly in mind what is meant when we hear sales promotion talked about? Looking over the various functions which go under that head in different places, it is apparent that there is nothing standardized about executives' definitions of the term. R. H. Grant, Chevrolet's remarkably successful vice-president in charge of sales, in a recent talk defines sales promotion from the standpoint of a car manufacturer as follows:

"First, make dealers operate good prospect systems as a foundation for their selling work. Second, find out the potential of every territory. Third, find out if there is enough man power in each territory to get the potential out of it. Fourth, canvass dealers to pick up good ideas. Fifth, nationalize the good ideas obtained from dealers so the whole selling force can have the benefit of such ideas."

* * *

Car Scrapping Enters Inner Circles

THE Chevrolet car scrapping plan has the attention of many executives in other factories as well as of many dealers for other makes of cars. All the dealers we have contacted thus far are unanimous in favoring the idea. Factory sales executives are interested, but on the average are not yet thoroughly sold on the plan in its entirety. The chief question raised seems to be that provision of a scrapping allowance in the list price simply gives the dealer a little more money to trade away and that the average dealer is likely to do just that thing. One man close to the industry has suggested that since the dealers seem to want a factory scrapping plan and since the factories are not actually opposed to it, the factories might well gain credit with their dealer organizations by granting the desires of the latter in this case. And the plan does result in getting off the road and out of the market a lot of cars which are upsetting to the traffic as well as the merchandising situation.

* * *

Politeness Progresses Despite Pessimists

TIMES do change. Some automobile purchasing departments have had the name among practically all parts makers and suppliers of being hard-boiled, tight-fisted and difficult to deal with. Talked recently with a man who has been doing much business of late with a purchasing department which for many years has been a leader among those having such a reputation. "The purchasing department of the ———— Motor Car Co.," this supplier said, "is today the pleasantest, squarest and finest outfit I have ever had the pleasure of dealing with. They aren't giving away anything, to be sure. There's no reason why they should. But they are treating us—and I believe other suppliers—fairly and in a most friendly way as regards commitments, prices and shipments." Who says things aren't continuing to get better in this old industry?—N.G.S.

Converting the *Landlubber* to the *With* Convincing *Body Design*

The gap between "motor consciousness" and "air-mindedness" may be bridged by easy stages if the plane is made to recall the family automobile.

IT is a commonplace of the automobile trade that motor cars generally are purchased after family councils in which the women have had about 90 per cent of the vote. Most women are interested, if they intend to drive themselves, in the ease of control and the efficiency of the brakes on a car under consideration. All of them judge a car by its appearance and its comfortable riding qualities. Certain of them consider nothing else, taking it for granted that any standard make of car will carry them somewhere and bring them back. Let the design as a whole be graceful and well-proportioned, let the paint combination harmonize, and the interior be appointed and upholstered luxuriously, and the car is as good as sold to the woman buyer.

The influence this truism has had upon the development of the automobile can hardly be overstated. If automobiles had remained the ugly objects they were fifteen years ago, regardless of the degree of mechanical perfection attained, the turnover in the trade would never have approached what it is today. Style sells cars as it sells clothes.

Certain airplane makers scoff at the idea that appearance must be considered at this stage of the aircraft industry. I believe they are dead wrong.

Certainly appearance will have no influence upon the types of planes that carry our mails, express and freight. Nor will it affect the planes used for combat and training by the armies and navies, or highly specialized types used for air racing, endurance flights, exploring, crop dusting, photography, aerial mapping and such utilitarian purposes, although none of those jobs would be disparaged by the proper application of paint in harmonious and pleasing combinations.

But the airplane industry cannot be content with such limited usefulness. It must appeal to the general public. Families and individuals must be induced to make use of airplanes as easily and nonchalantly as they now use automobiles, trains, subways, elevators, and steamers. In the aviation industry, we believe that day is coming. How, we ask, can we speed up its arrival? By instilling confidence in aircraft into the man and the woman—particularly the woman—on the ground, who are now in a more receptive mood on the subject than ever before.

Since the automobile is far more familiar than any means of land travel, it should serve as the basis of exterior design of land planes. The gap between "motor consciousness" and "air-mindedness" will be bridged by easy stages if everything possible about the plane is made to recall the family motor car. Suppose we trace out the steps by which the eye-appeal of the motor car can be applied to the airplane.

The first and easiest step is in the paint scheme. In no other vehicle, indeed perhaps in no other product offered to the public, have there been used such wild and impossible combinations of color as on the average sports airplane. Visibility, of course, must be considered, but I do not believe the horrible oranges and yellows used in the past on wings and fuselages are necessary. Use a color which will be visible enough and still be neutral to any other color on the plane, taking care always to keep the darker color above the lighter, as this reduces the apparent height and accentuates the length. Let the colors be bright, if you like, but do not violate convention and good taste by absolute disregard of every law of color harmony.

Then consider the doors and windows. Doors must be wide enough and high enough to permit ease of entrance and exit. Skittish persons dislike crawling through a trap door. Most of them can't help thinking, in the old groove of ground-consciousness, of how hard it would be to get out if something went wrong. That's strange to an airman, but it must be considered gravely.

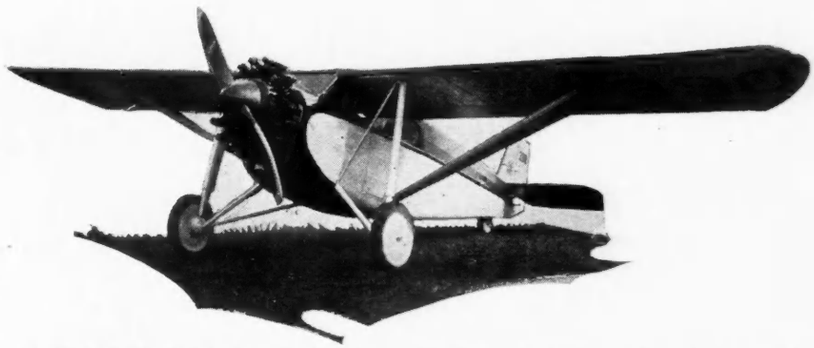
The fuselage structure, therefore, must be designed with this in mind. Bracing tubes must not cut off the corners of the door openings. Unnecessarily wide gaps between windows must be eliminated, because most persons don't like to be shut up where they can't see out, particularly when they fancy they are in danger. Witness the panics that occur in subway trains when minor accidents happen. A passeinger is just as safe in an airplane without windows, but he won't thank you for telling him so. He must have plenty of windows. Let him have them, by all means.

Again, the skeleton of the fuselage should be so designed that none of it shows in the window openings, without weakening the structure of the plane. Few laymen have any idea of the heavy load that may be im-

View of a German plane which suggests the motor car in cabin design

Airplane

By
H. C. WENDT*



A Fairchild plane in contrasting streamline colors, with windows of the type suggested by Mr. Wendt

posed safely upon a tube of chrome-molybdenum steel that looks as though one could snap it in two with his hands. When such a tube is exposed, the thought naturally comes to the passenger's mind: "Can this thing possibly be safe?" and he will thank his stars to get back to firm earth safely, say the experience was great, and stay out of airplanes as long as possible thereafter, considering himself a hero for having made one flight.

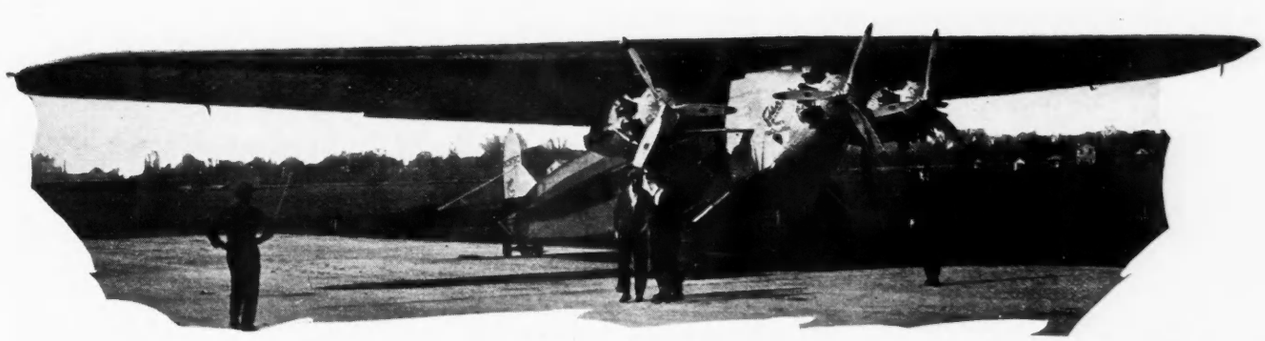
In the design of an automobile, window form and arrangement is considered one of the most important details. The airplane must conform to that. Windows should be long and narrow, to accentuate the apparent length of the cabin and reduce the apparent overall height of the fuselage, else the machine will appear top-heavy. Freak shapes which do not blend with the rest of the design must be tabooed. Each window should be framed, like the automobile's, with beautifully finished sheet metal, the window set in and the metal flanged to meet it, giving the appearance of the solidity which it actually possesses and avoiding the "tinny" impression the exposed edge of sheet metal always makes. A fairly wide molding running the full length of the fuselage exterior, just below the windows, will add to the apparent length and slenderness and form a logical breaking point for the two colors or shades of the fuselage's external finish.

Harking back to the door—pyschologically a door an inch or less than an inch thick is very bad. Many timid souls wrongly consider a flimsy-looking door the only thing between them and a long, dizzy drop. If ever they tried to open a cabin door against the hundred-mile wind, plus the propeller wash, which holds the door shut (and all airplane cabin doors open against the slipstream wind) they would see the absurdity of that notion. But again, the airplane maker should obviate that by making all doors light, but thick and husky looking. The added feeling of security is far out of proportion to the extra cost and slight extra weight involved. There again, in planning a light door that appears heavy and substantial, the more canny airplane designers are taking a leaf out of the open book of automobilia.

Noise, too, must be reduced to the minimum by exhaust mufflers (a successful one recently was tried out on a Fairchild plane. It reduced the engine explosions to a murmur that was lost in the whir of the propeller), and by the use of sound-absorbing and sound-deflecting materials around the entire cabin so that passengers may talk without strain.

I maintain that the public buys the plane, and should be considered first. Airplane construction has progressed to a point where performance and safety may be taken for granted in any plane turned out by a reputable maker, just as they may be and are taken for granted in most motor cars. The features that will sell air travel, and later, private airplanes to the public, are not the qualities that sell it to the pilot. If a wide cabin decreases air speed a few miles an hour, let it. The average person would as soon travel at 110 miles an hour as at 115, and far sooner if he can be comfortable at the slower speed. And it is the average man and his wife—particularly his wife—that the airplane maker must convert to air travel.

* *H. C. Wendt, body engineer in charge of cabin design and paint specifications for the Fairchild Airplane Manufacturing Corporation, Farmingdale, L. I., formerly was assistant to the chief engineer of the Moon Motor Car Company, in charge of body design, and served Briggs and other body makers in a similar capacity.*



This view shows the trimotored Fokker purchased by Lawrence P. Fisher, president and general manager of the Cadillac Motor Car Company

Losses In Worm Gear *Vary* With *Rubbing Speed* and Tooth *Load*

Test data given in report of A. S. M. E. Special Research Committee analyzed as though drives formed simple thrust bearings.

INTERESTING data on friction losses in worm gears, and their dependence on "rubbing speed" and "tooth load" are contained in a recent progress report of the A.S.M.E Special Research Committee on Worm Gears. Test data on worm gears were collected and were analyzed as though the drives formed simple thrust bearings; that is, the pitch-line velocity of the worm was taken as the "rubbing speed," and the axial thrust of the worm as the "tooth load."

It is pointed out that the frictional losses in a worm gear drive are made up of three separate items; namely, the loss due to churning of the oil in the case, the loss due to bearing friction and the loss due to friction at the tooth surfaces. These different losses, moreover, are so interrelated that it is difficult to separate them. Probably the frictional losses at the tooth contact surfaces are of most interest. Concerning these the Committee states that there are so many possible combinations of loads, speeds and lubricants that no single curve can be drawn which will represent graphically the power loss at the worm mesh, yet it will attempt to picture some of the possible combinations.

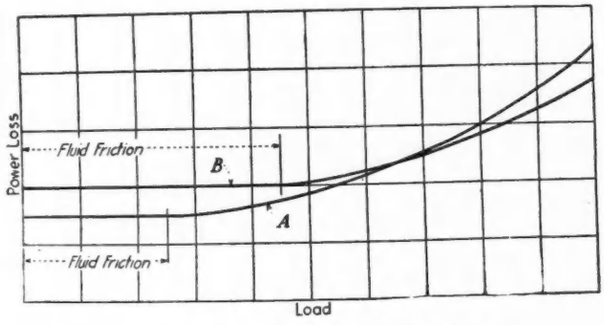


Fig. 1—Variation of power loss with load (speed constant)

Assume a drive operating at constant speed. In Fig. 1 are drawn two curves representing the change in the power losses as the load is increased, curve *A* representing the conditions with an oil of low viscosity, while curve *B* represents the losses with an oil of higher viscosity. As long as fluid friction is present, the lower-viscosity oil gives a smaller power loss. Fluid friction may be maintained, however, under heavier loads with an oil of higher viscosity; hence at some point the two curves will cross each other; and under the more severe load conditions the oil of higher viscosity will show the smaller power loss. These two curves are based on two lubricants of the same general characteristics except for the viscosity. This condition exists in test AW-5, and the graph of those tests, Fig. 2, shows such a crossing of the two curves as that in Fig. 1.

If the oil of lesser viscosity is of a greater oiliness than the other, although the two curves might start out

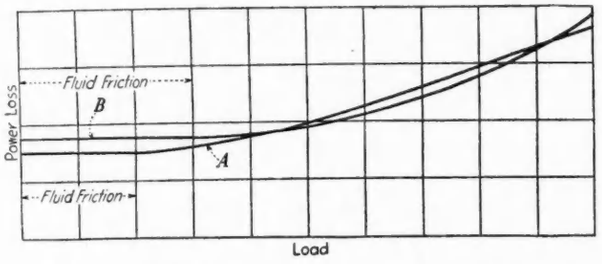


Fig. 3—Variation of power loss with load (speed constant)

as before and cross each other, under extreme conditions of load, curve *A* would be flatter than curve *B*, so that the two curves would cross each other again, and the oil of lesser viscosity but greater oiliness would again show a smaller power loss than the other. Such a condition is represented in Fig. 1 by curves *A* and *B*.

As another example we shall consider some of the possible conditions with constant loads at varying speeds. As the power loss is small at very low speeds, although it may be a very large percentage of the power transmitted, the change in the frictional conditions will show up more distinctly when the curves represent the change in the frictional resistance rather than the power loss itself. When the speed is constant, the shape of the curve is the same whether it represents frictional

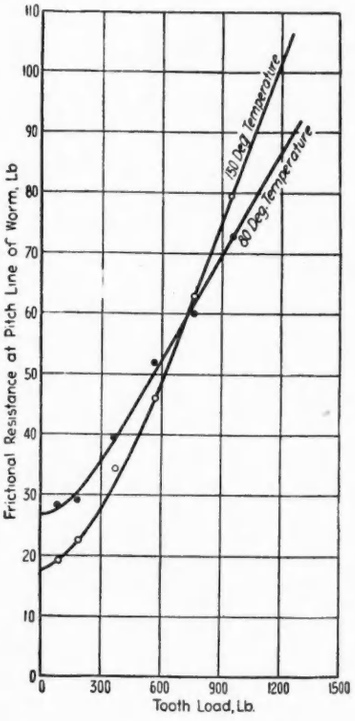


Fig. 2—Frictional resistance vs. tooth load of worm gear drive AW-5

resistance or power loss in the woven gearing.

Under very light loads, when fluid friction is maintained, the frictional resistance is dependent upon the rubbing speed and the viscosity of the oil at its working temperature. This might give us practically a straight line as shown at *A* in Fig. 4. An increase in load would not change the frictional resistance so long as fluid

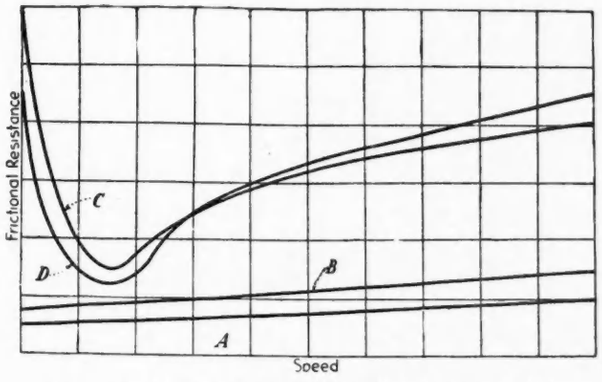


Fig. 4—Variation of frictional resistance with speed (load constant)

friction was maintained. If an oil of greater viscosity were used, we should have the curve *B* to represent similar load conditions. This line would start a little higher and probably rise a little faster than the first line.

If the load were increased so that a perfect oil film

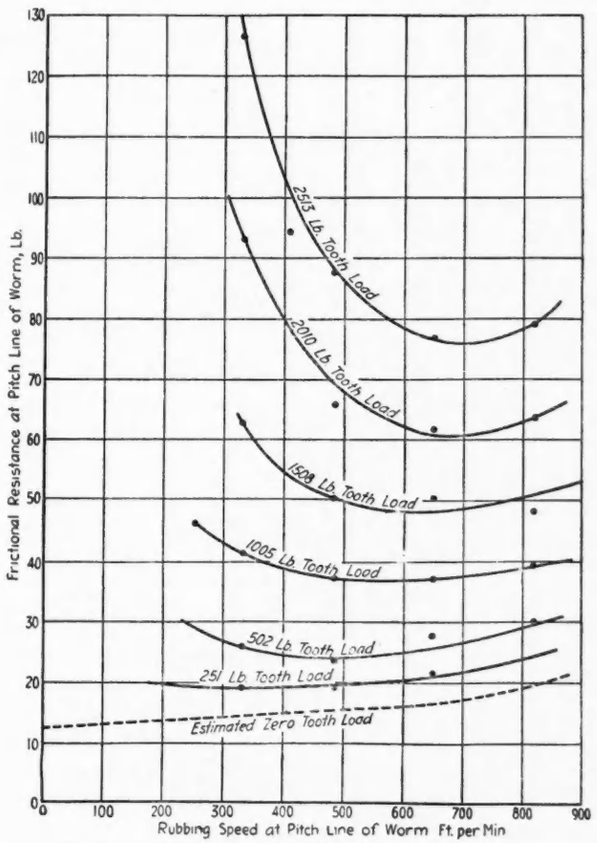


Fig. 5—Frictional resistance vs. rubbing speed worm gear drive AW-1

could not be maintained, we should have the conditions represented by curve *C*. Here the static or starting friction would be very high. The frictional resistance would reduce rapidly to a minimum as the speed was increased, and then rise again slowly with a further increase in speed. The higher the load, the more pronounced the form of this curve will be. This general condition is very apparent in the graph of test AW-1, Fig. 5.

Under these same conditions with an oil of greater viscosity we should have the conditions represented by curve *D*. Here the static or starting friction is lower, but after the frictional resistance had reached its minimum it would rise faster than with the lighter oil.

In general, the graphs of the test data seem to indicate that the conditions are very similar to those outlined in this very incomplete analysis.

The pitting of tooth surfaces may now be considered in more detail. Most of the physical properties of the materials commonly used in the construction of worm drives have been already established, although reliable information on compressive strength and compressive fatigue is conspicuous by its absence.

In many respects the contact between a worm and gear as regards the maximum compressive stresses set up is very similar to that between spur gears, so that a reasonably true measure of these stresses should be obtained by using a similar method of analysis. Therefore we shall tentatively use the following expression for this purpose:

$$W_s = DFKQ \quad \ldots\ldots\ldots\ldots\ldots\ldots [1]$$

where W_s=equivalent static load, lb.
D=pitch diameter of worm gear, in.
F=minimum length of contact, in. (This length to be the projected length of contact lines on plane perpendicular to axis of worm.)
K=load-stress factor. (Same as for spur gears.)
K=75 for hardened steel worm and bronze gear. (This value gives a probable factor of safety of about 2.)
Q=curvature-ratio factor and will vary from 2 to 6, depending upon the nature of the contact lines. In the case of most of the drives of conventional design, the value of 2 should be used.

The accuracy of the worm and gear and of the alignment controls the amount of the theoretical contact which is actually obtained, and influences the intensity of the maximum loads set up when the drive is in operation. With reasonable accuracy, the drive will tend to wear to more nearly complete contact. If the errors are large, however, the tooth surfaces may start to abrade before full contact is secured, and when this abrasion is excessive, the tooth surfaces will be too far destroyed to ever match and polish down again.

As with other gears, the intensity of the maximum instantaneous load will depend upon the characteristics of the materials, the extent of the errors, the velocity of the engagement, the magnitude of the effective masses, and the amount of the load to be transmitted.

The velocity of the engagement as it affects the intensity of the maximum impact load is probably very similar in its influence to that of other types of gears. The helical action of the worm thread probably softens the impact conditions set up by minor errors, so that the mating profiles may never actually leave contact with each other. Under such conditions, the maximum load would be a suddenly applied one with double the intensity of the working load. Therefore, for the purposes of preliminary analyses and comparison we shall tentatively use the following equation as a measure of the influence of the pitch-line velocities:

$$W=W_s\left(\frac{100}{200+V}+0.50\right)\ldots\ldots\ldots[2]$$

where W_s=equivalent static load, lb.
W=transmitted tooth load, lb.
V=pitch-line velocity of worm gear, ft. per. min.

This equation gives us the following velocity factors:

V	Velocity factor	V	Velocity factor
100	0.833	1100	0.577
200	0.750	1200	0.571
300	0.700	1300	0.567
400	0.667	1400	0.563
500	0.643	1500	0 559
600	0.625	1600	0 556
700	0.611	1700	0.553
800	0.600	1800	0.550
900	0.591	1900	0.548
1000	0.583	2000	0.545

Practically all test data are based on steady load conditions. Where more severe conditions have to be met, smaller load values must be used. It may be possible to establish service factors for the different types of service which must be performed. Experience seems to indicate that these factors would vary from about unity for steady load conditions to about one-third for the most extreme conditions. In other words, a drive subjected to intermittent shock or overload conditions could only carry a normal load of about one-third of what it should carry under steady load conditions. This factor must be taken into consideration when comparisons of service data are made.

Taking drive AW-4 as an example of the use of these tentative equations, we have the following factors for the solution of Equation [1]:

D=20.770 K=75
F= 5.50 Q= 2.0

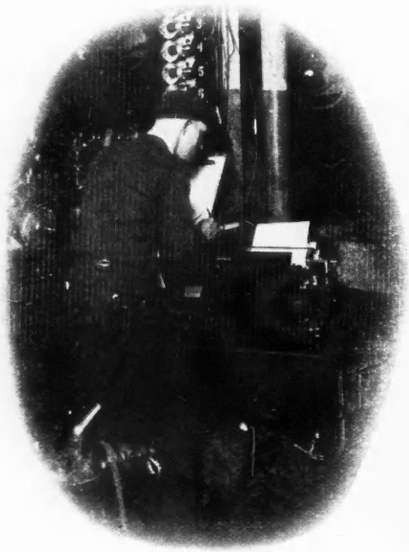
whence W_s=17,135 lb.

For Equation [2] we have V=215, whence

$$W=0.74W_s$$

The actual tooth load developed by transmitting 20 hp. is equal to 3070 lb. According to the foregoing equations, the safe maximum load as far as fatigue is involved on this drive is 17,135×0.74=12,680 lb., or about four times the actual load. This safe load includes a factor of safety of about 2.0, so that the actual load is about one-eighth of the critical load, or a contact line one-eighth of the theoretical one of 5.500 in. should just carry the load. This checks very well with the actual conditions found on this drive in service, because after contact was made over a surface of from ½ in. to ¾ in. in width, further wear was not apparent.

Studebaker Installs Plant Communication System



Receiving a message over the typewriter-telephone system recently installed in the plants of the Studebaker Corp.

AN illustration of the value of seconds in modern manufacturing is the installation by Studebaker at South Bend, of a new system of inter-department and intra-plant communication which combines with the speed of the telephone, the accuracy and permanency of typewritten orders. The system is known as telephone-typewriter service.

By the use of the new service the different departments in the plant are kept informed of the sequence of models to be assembled.

Twenty-two machines are used in two other units. One consists of three sending and receiving machines in the body department connecting with a receiving machine in the office of the production superintendent. The other group consists of a sending and receiving machine in the final assembly office.

The typewriter-telephone system of communication recently was installed in the plants of the Studebaker Corp. at South Bend, Ind. Various departments in the huge plant are kept informed of the sequence of models being assembled in the final assembly room, and can organize their production accordingly

N. A. C. A. Cowling Experiments *Interest* S. A. E. *at Detroit*

Aeronautic meeting held in conjunction with All-American Aircraft Show hears authorities in airplane field. Approval voted on proposed standards for craft parts.

By ATHEL F. DENHAM

CHARACTERIZED by Chairman E. P. Warner as the most revolutionary aircraft development in recent years, the N.A.C.A. cowling, the origin and application of which was described in a paper by Dr. C. W. Lewis, Director of Aeronautical Research, National Advisory Committee for Aeronautics, proved of intense interest at the technical session of the aeronautic meeting of the S.A.E. held in Detroit, April 9 and 10, in connection with the All-American Aircraft Show there. That the discussion did not last far into the night was mainly due to the fact that Dr. Lewis covered all possible angles of the problem so thoroughly.

In attacking this problem, the N.A.C.A., according to Dr. Lewis, decided on a definite progressive method of cowling design, there being three distinct types for open cockpit and seven types for cabin ships. Each type of cowling was tested for drag and various air speeds in the 20-ft. wind tunnel at Wright field, after proper assurance of adequate cooling was reached with each type. The investigations were conducted on a Wright J-5 engine, the fuselage being altered only in the nose in going from one type of cowling to another, which naturally involved a rebuilding of the nose for a fair comparison on aerodynamic possibilities of each type.

Anthony H. G. Fokker, consulting engineer, Atlantic Aircraft Corp., and Fokker Aircraft Corp., who addressed the S.A.E. at Detroit

Reports of the tests run are given in technical reports 314 and 315 of the National Advisory Committee. The final type adopted, known as the N.A.C.A. cowling, showed a startling decrease in parasite drag of the engine, resulting in an increase in top speed of 20 m.p.h. on the Lockheed Vega installation, and 16 m.p.h. on the Pitcairn Mailwing. Tests showed that the J-5 engine alone had a drag resistance of 178 lb. On adding a fuselage and without cowling, a 40 per cent reduction was obtained and on cowling the engine in, the total drag with fuselage was brought down to 43 lb.

In attempting to apply the N.A.C.A. cowling to three-engined ships, however, extremely disappointing results were obtained at first, according to Dr. Lewis. On a Fokker F-VII, the total gain of only a mile or two pointed to the necessity of further investigation. A model of a Fokker wing and engine nacelle for the wing engine was built; and it was immediately disclosed that the lack of gain was due to interference effects set up by the close proximity of cowling and lower wing surface. Actual tests in this direction showed that with the cowling installed, the air in back of the engine nacelle actually flowed forward.

In the model investigations, the next step was to move the engine mount to various positions in relation to the wing leading edge, and the final type, on which the maximum reduction was obtained, with the engine nacelle built into the leading edge of the wing and well faired, showed a drop in drag from 111 lb. for the original N.A.C.A. cowling installation, to 14 lb. for the final. The drag figure of 111 lb. alone showed, Dr. Lewis pointed out, that a change in installation design was necessary for wing engines, for the engine nacelle with the cowled engine without the wing showed a drag resistance of only 40 lb.

Dr. Lewis emphasized the necessity of research investigation on each new type of plane and engine to which this general type of cowling is to be applied. For one thing, he said, the frontal opening for the admission of air cannot be made in proportion to the hp. of the engine, due to the difference in heat dissipation in relation to outside diameter of the engine. For a Wasp, for instance, which has twice the horsepower of the J-5, 2.52 times the frontal opening must be used. Moreover, careful working out of the peripheral slot at the rear of the cowling, between it and the fuselage, is required. On one installation, where sufficient cooling was not obtained, widening the slot from one to three inches dropped the gain in speed primarily obtained considerably. The possibility of providing a slot shutter for heat control was suggested, however. In cool weather, this could be kept closed, or

nearly so, obtaining a higher top speed, and further opened in hot weather. Some of the important design features to be kept in mind in the adaptation of this type of cowling to current production were given by Dr. Lewis. Some of these are:

1. The cowling and fuselage back of it must form a perfect streamline shape.
2. Frontal openings must be sufficient to admit enough cooling air for all cylinders.
3. Baffling or some form of directional air control inside the cowling must be provided to see that no air is wasted. Thus, for instance, the J-5 cowling had cowling plates for the magnetos and deflectors near the rocker arm boxes, which require no cooling.

The possibilities of increasing top speed still further by the adoption of T-head cylinders with the exhaust valve in front for radial, air-cooled engines to be used with this type of cowling were suggested by Dr. Lewis. The gain, of course, would be due to reduction in overall diameter. Cowling of individual cylinders, according to Dr. Lewis, does not seem to offer much promise.

During the discussion, it was suggested that some of the increase in speed obtained may be due to an "airfoil" section of the outer and inner shells of the cowling, but Dr. Lewis said he did not believe that this was the case.

Recent tests on slotted wings, wing flaps, etc., by the Navy Department were described by Lieutenant C. B. Harper of the Bureau of Aeronautics. Lieutenant Harper expressed surprise that more interest in the Handley Paige—cum—Lachman slotted wings has not been shown by commercial airplane manufacturers in this country.

Lieutenant Harper admitted, however, that the installation of such a slot on any new airplane requires a great deal of tailoring and research in order to obtain maximum effectiveness, and that with high lift airfoil sections the gain of control effectiveness after the stalling point has been reached for the normal wing is not so pronounced.

In the work of the navy on this subject, a "spoiler" flap working in conjunction with the aileron control has proved rather effective. The flap is built into the upper wing side just back of the top of the camber. In operation, the rear edge of the flap swings upward and forward about the front edge, "spoiling" the air flow over the wing and assisting the aileron in dropping that wing.

Magneto Compass Based on Earth Inductor Type

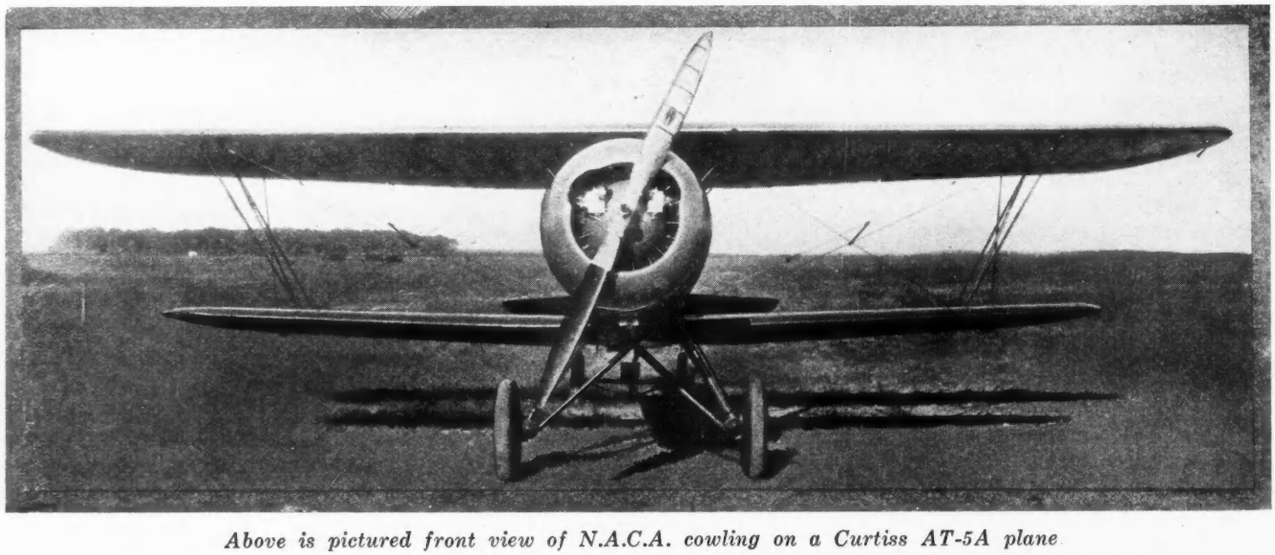
PRECEDING a novel afternoon session devoted to the question of motorless flights, with addresses by Reed Landis, Amelia Earhart, Dr. Wolfgang Klemperer of the Goodyear Zeppelin Company, and Anthony H. G. Fokker, as well as motion pictures of glider flights, a paper on the "Magneto Compass" was presented by F. P. Wills of the Aircraft Engineering Department, General Electric Company.

This new device, a development based on the earth inductor compass, according to Mr. Wills, has a number of important advantages over current types among which are:

1. Absence of a universal joint for the commutator drive, and the errors involved through inaccurate manufacture and misalignment of such a joint.
2. There are no stabilized parts in rotation.
3. A higher voltage is developed.
4. Commutator errors are eliminated.
5. The instrument is smaller and lighter than existing types of earth inductor devices.

Briefly, the instrument consists of two 12-in. bars of Permaloy, a 78.5 per cent nickel iron, which has a high permeability that is used for boosting the earth's magnetic field by "sucking in" lines of flux. Between these opposed pole pieces is located the stabilized armature of simple H shape with the poles in spherical shape, matching the concave spherical pole piece ends. The armature is wound with a few turns of wire leading to the commutator, which is mounted on the same shaft as the armature and anemometer, the entire unit being stabilized in a horizontal plane by a pendulum mounting provided with a "liquid flow" damper.

The rectifying commutator is of the two-bar type and due to its small size and consequent low peripheral speed is said to obviate the frequent cleaning and high resistance attributed by Mr. Wills to the earth inductor compass.



Above is pictured front view of N.A.C.A. cowling on a Curtiss AT-5A plane

View of the Eaglerock Bullet, of the Alexander Aircraft Co., exhibited at the All-American Aircraft Show in Detroit. The plane is powered with a Kinner 100 hp. engine, with a top speed of 130 m.p.h. and landing speed of 42 m.p.h.

Approved Craft Parts

TENTATIVE approval for a recommended practice for airplane rims, tires, and stub axles and approval of proposed standards for instrument mounting dimensions, thermometer bulbs, propeller blade ends and flanged magneto mountings were high lights of the Standard Session of the Aeronautical Division of the Society of Automotive Engineers. The Army-Navy standard for propeller clamp rings, bolts and nuts was also adopted as a recommended practice, while changes in a number of previous standards were approved.

Ten landing gear and five tail wheel tire sizes are included in the recommended practice, as follows:

Rim Ledge Diam.	Tire Size	Oversize Tire	Std. Tire Max. Load	Std. Tire Pressure
4 in.	10 by 3	.....	325	50
8 in.	14 by 3	16 by 4	400	50
12 in.	18 by 3	20 by 4	525	50
16 in.	24 by 4	26 by 5	850	50
20 in.	28 by 4	30 by 5	1,000	50
20 in.	32 by 6	36 by 8	2,200	55
20 in	30 by 5	32 by 6	1,600	50
30 in.	36 by 8	40 by 10	4,000	60
24 in.	44 by 10	.....	6,300	65
30 in.	54 by 12	58 by 14	10,000	70

Tires from 14 x 3 to 28 by 4, inclusive, are for drop center rims. Tires for 18 in. rims are not included (24 by 3 and 26 by 4) as they are used only to replace clincher sizes that are becoming rapidly obsolete. The maximum loads shown are based, except for tail wheel tires, on a 27.5 per cent deflection. Straight side and drop center rims for airplanes as adopted by the Tire and Rim Association were adopted as a proposed standard. While tentative approval was accorded the proposed airplane wheel plain and anti-friction bearing recommended practice, it was decided to refer this to the ball and roller bearing division for further consideration.

Instrument mounting dimensions, substantially the same as those adopted by the Army and Navy, were approved as a proposed standard. Two sizes of cases are provided, one for thermometers, pressure gages, ammeters and voltmeters, which have dials of a nominal diameter of 1⅞ in., and a larger one for tachometers, air speed indicators, turn and bank indicators, clocks, etc., which have dials of 2¾ in. nominal diameter. The depth of instruments must not exceed 2½ in. for the smaller and 4¾ in. for the larger case. Tolerances are specified on all dimensions. Specifications of engine thermometer bulb dimensions were also approved as a proposed standard by the Aeronautical Division.

Approval was also accorded the proposed change in the S.A.E. standards for storage batteries, increasing the minimum current for 20 min.-amp. to 44, 66, and 99 for batteries 32, 34 and 36. The Aircraft lighting committee also reported that test lighting equipment for night flying is being installed on a Boeing, a Ford, and a Pitcairn plane. It is hoped that by this means some form of recommended practice may be evolved as a result of actual test.

A revision of the present S.A.E. specifications for tachometer drives was adopted. Adoption of a proposed larger No. 50 hub and shaft end was withheld pending further investigation of dimensions. A revision of the present standard for S.A.E. No. 10 to 40 shaft ends, to include a dimension which would locate definitely the rear cone, was adopted. The AN standards for propeller blade ends was adopted as a proposed standard. The AN standards for clamp rings, bolts and nuts were finally adopted as a recommended practice although there was considerable dissension.

The proposed standard for wood propeller hubs was referred back to the committee for further consideration, the main objection seeming to be that the free flange was at the rear, necessitating pulling of the hub to remove the propeller.

Fog-Flying Problems

THE awarding of the Wright Medal to Lieutenant Commander Clinton H. Havill for his paper on Propeller Design at the Chicago Aeronautical Meeting, and an address by Brig.-General W. E. Gilmore, chief of the Material Division, Army Air Corps, on developments at Wright Field, were the high lights of the dinner meeting.

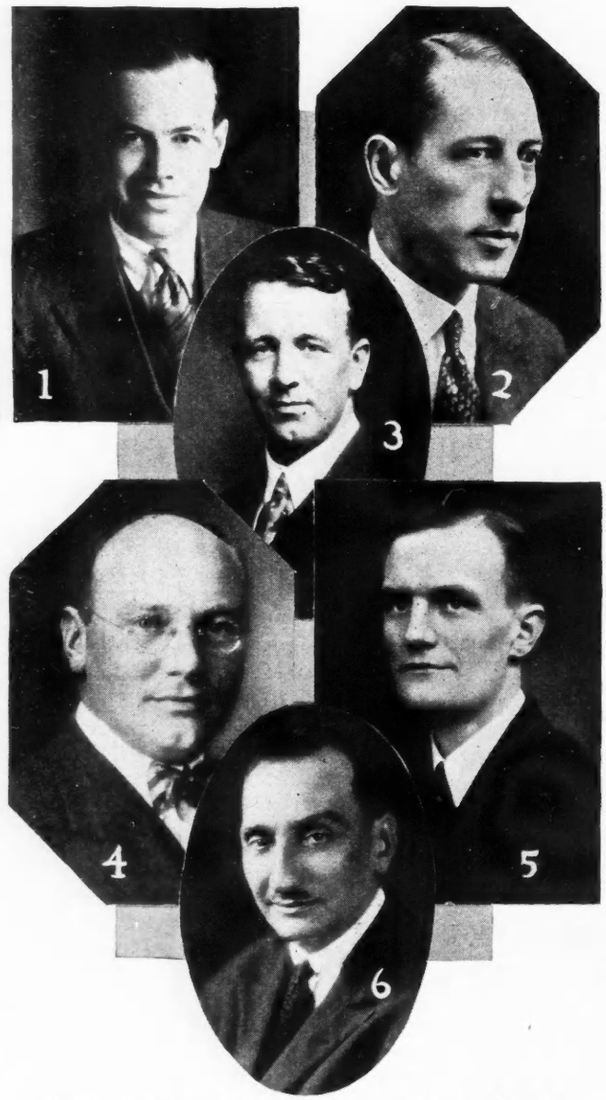
General Gilmore, besides giving a general description of additions made to the research equipment at Wright Field, including the provision of dynamometers capable of handling engines up to 1500 hp., and test rigs for 40 ft., 6000 hp. propellers, and speeds up to 4500 r.p.m., expressed confidence that the problem of fog-flying would eventually be solved through research work now being conducted.

General Motors *Regional Directors* To *Discuss* Foreign *Problems*

Schedule calls for conclave next month at Shawnee-on-Delaware followed by two weeks' inspection tour of principal production and assembly plants

By Carl H. Getz
General Motors Export Division

WHEN the average company wants to hold a conference, some one presses a button, a few chairs are drawn up to a table and the meeting is started.



European delegates to the General Motors Foreign Executives' Conference will include (1) I. W. J. Mougey, Stockholm; (2) W. L. Pavlovski, Warsaw; (3) C. J. Bartlett, London; (4) D. F. Ladin, Copenhagen; (5) E. C. Riley, Antwerp, and (6) B. F. Loygorri, Madrid

If the concern is engaged in interstate commerce, a telegram or a few long-distance calls will bring the executives together within a few days or a week at the most.

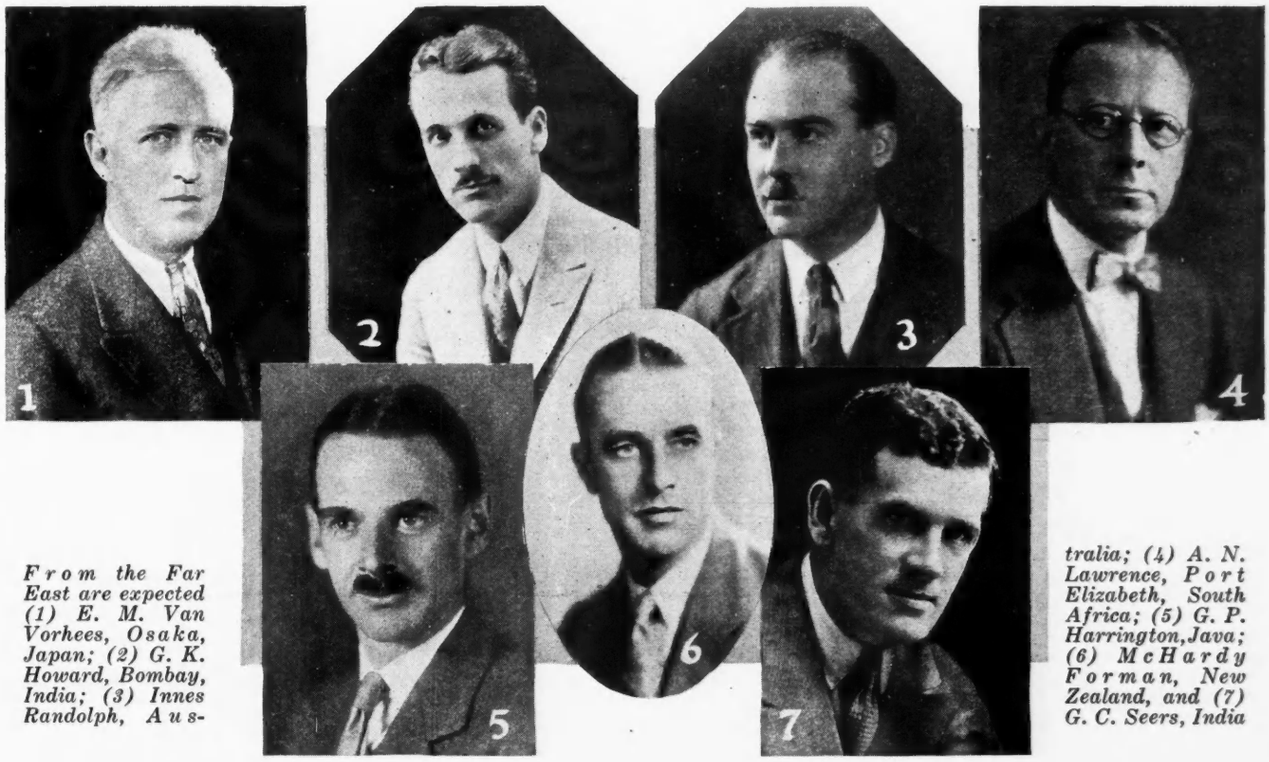
If the company is doing business overseas, it probably gets along without conferences of all its executives. One would imagine that to be true especially in the case of a company doing business in more than 100 countries, a company which sells nearly a million dollars' worth of automobiles, trucks and buses a day, a company employing 20,000 men and women, operating through 9000 distributors and dealers and using 50 languages.

The General Motors Export Division, to which the overseas business of the General Motors Corporation is entrusted, consists of 22 assembly plant and warehouse operations in almost as many countries. It includes the General Motors Export Co., which operates in countries where there are no General Motors assembly plants, and is associated also with Vauxhall Motors, Ltd., of Luton, England, and the Adam Opel Co. of Russelsheim, Germany.

James D. Mooney, vice-president of the General Motors Corp. in charge of overseas business and president of the General Motors Export Division, came to the conclusion that a conference would result in such positive benefits to his organization's welfare that despite the distances to be traveled and the time lost away from offices, he decided to call the meeting. That was more than a year ago. Committees in the home office in New York were appointed and at once went to work. The dates selected were May 22-30. The place picked was Buckwood Inn, Shawnee-on-Delaware, Pa., a delightful spot where nothing can interfere with the progress of the conference.

Members of the conference include the regional directors for Europe, South America, the Far East and the Caribbean; managing directors of plants located in London, Paris, Berlin, Antwerp, Copenhagen, Stockholm, Madrid, Warsaw; Sao Paulo, Brazil; Buenos Aires; Montevideo, Uruguay; Sidney, Melbourne, Adelaide, Perth, and Brisbane, Australia; Wellington, New Zealand; Batavia, Java; Bombay, India; Osaka, Japan; Alexandria, Egypt, and Port Elizabeth, South Africa. In addition, the managing director and chairman of the board of Vauxhall Motors, Ltd., of Luton, England, and the liaison officer at the Adam Opel Co. in Germany will attend.

The conference will be opened by Mr. Mooney. W. T. Whalen, general manager, will present then a resume of the "Review and Outlook Report," a carefully edited document recording the accomplishments of the last



From the Far East are expected (1) E. M. Van Vorhees, Osaka, Japan; (2) G. K. Howard, Bombay, India; (3) Innes Randolph, Australia; (4) A. N. Lawrence, Port Elizabeth, South Africa; (5) G. P. Harrington, Java; (6) McHardy Forman, New Zealand, and (7) G. C. Seers, India

few years and the outlook for the future. L. M. Rumely, general manager, will define general policies and objectives. The afternoon of the first day of the conference will be devoted to finance. The afternoon of the second day will be devoted to manufacturing, with M. F. Lawrence, general manufacturing manager, leading the discussion. Mr. Rumely will open the discussion Saturday morning, May 25. Subjects to be considered are "Effective Personnel Development," "Programming Personnel Movements," and "Personnel Policies."

"The Organization and Operating Principles of the Export Division" will be discussed by Edgar W. Smith, assistant to the president, the same morning.

The subject of supply will have the attention of the conference members, Monday, May 27, with William Harvey, Jr., general supply manager, leading the discussion. Sales will be considered beginning Tuesday, May 28. Harry Tipper will lead discussion.

Following the conference, the members will board an eight-car special train for a visit to Detroit, Flint, Pontiac, Lansing, Oshawa, Milford and Cleveland. Two weeks will be required for this trip of inspection.

The General Motors Export Division is so organized that each key man has an assistant so trained and with such background that he can carry on in the absence of his chief executive. The executives of the General Motors Export Division know that the conference is going to give them a better idea of how well the assistants have been trained and how well they can do their jobs in the absence of their managing directors.

General Motors representatives in South America expected at the Conference will be (1) G. W. Wolf, Argentina; (2) Albert M. de Tonnay, South America; (3) A. F. Bassett, Brazil; (4) P. E. West, Uruguay, and (5) N. C. Tuxbury, Caribbean

Formation

Vincent Bendix, president of the new Bendix Aviation Corp.

VINCENT BENDIX announced, April 13, the formation of the Bendix Aviation Corp., which will be capitalized with an issue of 3,000,000 shares of no par value stock, of which 2,200,000 shares presently will be outstanding.

"The Bendix Aviation Corp. is being formed," Mr. Bendix stated, "to acquire the assets and business of the Bendix Corp. and subsidiaries, including the Bendix Brake Co., the Eclipse Machine Co. and its subsidiaries, the Delco Aviation Corp., the assets and business of the Stromberg Carburetor Co. of America, including subsidiaries, the Scintilla Magneto Corp., and other companies in the general aviation accessory field."

Stockholders of the Bendix Corp. will be afforded the opportunity to exchange shares on the basis of two Bendix Aviation Corp. shares for each share of the present Bendix Corp. stock. Stromberg Carburetor stockholders will be given the opportunity to receive one and one-fifth shares of Bendix Aviation Corp. stock for nine shares of Stromberg now held. General Motors will turn into the new company valuable rights in the aviation accessories and rights in connection with other devices. The Electric Auto-Lite Co. also will contribute patent rights.

Exceptional interest attaches to this announcement, not only because of the number, importance, and diversity of the interests involved, but because for the present and the near future it means control of nearly all of the aviation accessory business by a single, integrated corporation, whose strength is indicated not only by the size of the enterprise, but by the presence on the board of directors of men representing the largest engine and plane manufacturers in the United States. The names of the directors and their connections appear in the box on the right-hand page.

According to the airplane engine specifications given in the *Chilton Aero Catalog and Directory*, Stromberg carburetors are used on 62 per cent of American airplane engine models, and Scintilla Magnetos are used on 68 per cent, including in both instances, all types of Curtiss, Wright, and Pratt & Whitney engines. In addition, Delco-Remy ignition is used on six per cent of American aviation engines.

Eclipse starters are standard equipment on 40 per cent of American engine models, including Curtiss, and when it is taken into consideration that starters are optional on Wright models, the percentage is perceptibly increased. In addition Scintilla magnetos, having a considerable foreign market, are used on German, Czecho-Slovakian, and French engines. The production figures for those engine models using Stromberg and Scintilla accessories for standard equipment show that, from a quantity standpoint, the new corporation virtually controls these important aspects of the airplane parts market.

The Bendix Corp., which will be the nucleus of the Bendix Aviation Corp., includes among its subsidiaries the Bendix Brake Corp. of South Bend, Indiana. The Bendix Corp. was formed in Illinois, in December, 1924, to acquire the Bendix Engineering Works, Inc., and the Bendix Brake Company, which had acquired the capital stock of the Perrot Brake Co. and 75 per cent of the stock of the International Gernandt Motors Co., which operates through the Gernandt Motor Corp. In October, 1928, 55 per cent of the common stock of the Eclipse Machine Co., which for 15 years had manufactured Bendix starters, was acquired and the minority interest in the

of *Bendix Aviation* Corporation *Merges* Aircraft *Parts Companies*

Representatives of many large engine and plane manufacturers are named directors of the organization which will be preeminent in its field of production

By Herbert Hosking

Eclipse Machine Co. was obtained by the Electric Auto-Lite Corp. The Bendix Service Corp. was formed in June, 1928, to take over the service of Bendix Brakes on the national basis.

The Bendix Corp. is the owner of 45 patents on the Bendix drive which expire in 1941. In addition to these, it has acquired the Perrot four-wheel brake patents, subject to a license granted to General Motors Corp. Forty other patents of various kinds are owned by the Bendix Corp., and all of them will come under the holding of the Bendix Aviation Corp. by its purchase of the older holding company. In 1928, Bendix introduced the manufacture of disk wheels and brakes for airplanes and has been successful in introducing both lines. On September 6, 1928, the capitalization of the Bendix Corporation was changed from 290,000 shares consisting of 65,000 shares $10 par value "A" stock and 225,000 shares of $10 par value "B" stock, to 600,000 shares of $5 par value common stock. The stockholders of the Bendix Corp. were permitted to exchange one share of the $10 stock for two shares of the $5 stock.

According to Mr. Bendix's statement, arrangements have been made for the Bendix Corp. to acquire all of the stock of the Eclipse Machine Co. and to turn this over to the new Bendix Aviation Corp. In addition to Bendix starters, the East Orange factory of the Eclipse Machine Co. produces an extensive line of aviation accessories. The Scintilla Magneto Corp. is controlled by the American, Brown-Boveri Corp. and it is supposed that control of Scintilla is being purchased from the latter.

The ignition system used on all Liberty aviation engines was developed and produced through what has become the Delco Aviation Corp. As late as March 7, the tendency toward the present merger was indicated when Vincent Bendix, C. M. Keyes of the Curtiss Airplane and Motor Co., and Richard F. Hoyt, chairman of the board of Wright Aeronautical Corp. purchased a substantial interest in the Stromberg Carburetor Co. of America from Charles W. Stiger, the retiring president of the Stromberg Co. It had been announced on January 12 that Stromberg started manufacturing airplane carburetors in a large scale with indications that the current production at the rate of $2,000,000 worth a year would be doubled by the end of 1929.

The United Aircraft & Transport Corp. was formed Dec. 17, 1928, as a holding company, consolidating the interests of the Boeing Airplane & Transport Corp., Pratt & Whitney Aircraft Co. and Chance-Vought Corp. Frederick B. Rentschler, president of the Pratt & Whitney Aircraft Co., became president of the United Aircraft & Transportation Co. and is on the Board of Directors of the Bendix Aviation Corp. Ford and General Motors were both represented on the directorate of the United Aircraft.

On Jan. 26, 1929, United Aircraft added to its holdings the Hamilton Aero Manufacturing Co. and the Hamilton Metalplane Co., which had been using Pratt & Whitney engines. The sale of the Eclipse Machine Co. majority interest to the Bendix Corp. was financed by the General Motors Corp. acting as agent for Bendix. General Motors interests bought Eclipse stock for cash and resold to Bendix at cost on a five year payment plan. A total of $5,448,000 is to be paid to General Motors by Bendix in four installments. Arrangements have been made by the Bendix Corp. to buy the minority interest in Eclipse, owned by the Electric Auto-Lite Corp. and to turn this over to the Bendix Aviation Corp.

These figures and historical notes show to a certain extent the unity of the interests involved in the new corporation. Huge economies in manufacturing and distribution will probably be effected.

THE Board of Directors of the Bendix Aviation Corporation will be as follows:—

Vincent Bendix, president of the Bendix Aviation Corporation; *C. E. Wilson*, assistant to the president, General Motors Corporation; *Richard F. Hoyt*, of Hayden, Stone & Co. and chairman of the board of the Wright Aeronautical Corporation; *C. O. Miniger*, president of the Electric Auto-Lite Co.; *Clement M. Keyes*, president Curtiss Airplane & Motor Co., Inc.; *Paul H. Davis*, of Paul H. Davis & Co., Chicago; *W. L. O'Neill*, president of the Stromberg Carburetor Co.; *Frederick B. Rentschler*, president of the United Aircraft and Transport Corporation; *Albert Bradley*, General Motors Corporation; *James C. Wilson*, of J. C. Wilson & Company and president of the National Aviation Corporation; *J. C. Ferguson*, president of the Eclipse Machine Company; *W. L. McGrath*, vice-president of the Eclipse Machine Company; *W. J. Buettner*, vice-president of the Bendix Brake Company; *Graham B. Grosvenor*, president of the Aviation Corporation.

A banking group headed by Hayden, Stone & Co., Paul H. Davis & Co., and James C. Willson & Co. will sponsor the new issue of stock.

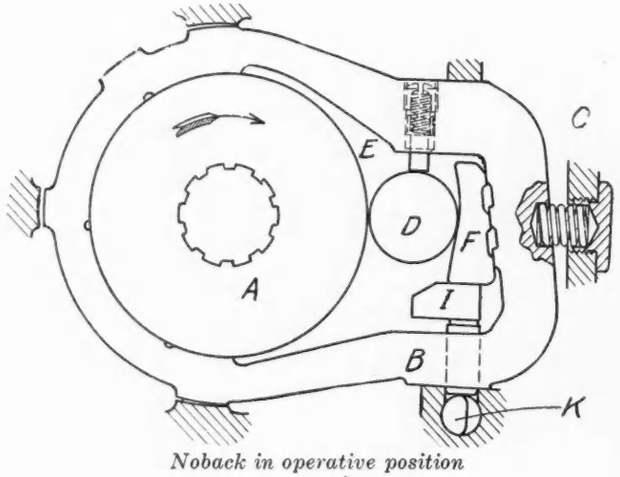
Inadvertent *Rolling* Backward *Eliminated* By *Noback*

Device first adopted for Stutz and Blackhawk continues to be popular feature. Unit operates through "Locking Hub" on rear transmission shaft.

THE Stutz Motor Car Company of America, Inc., the first company by several months to embody in its design and in its production cars the Noback, reports a remarkable public interest in this new and very desirable feature which owners have been able to test thus far only on Low-Weighted Stutz and Blackhawk cars.

Developed and perfected by Stutz engineers in conjunction with the Detroit Gear and Machine Company, the Noback not only attracted unusal attention throughout the national and local show season just ended, but has met with unprecedented enthusiasm in the hands of the public.

The fact that this unit functions automatically and requires no attention from the operator, makes it highly desirable as well as useful. The only means of control the operator has over the unit is through the gear-shift lever. When the gear-shift lever is placed in the reverse position, the Noback is automatically released, permitting the car to be driven in a reverse direction. After the car has been driven in a reverse direction, the Noback does not become operative until the car is again moved in a forward direction. The forward movement of the car need be only one to one and one-half inches. The reason for the Noback being designed so that it is necessary to drive the car forward before it becomes operative, is to prevent any strain being placed on the driving units due to the Noback arresting the backward roll of the car just as it starts the rearward movement and not after the motion is well under way.

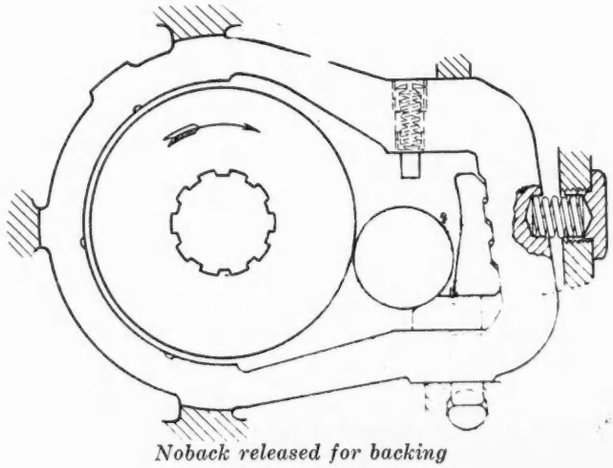


Noback in operative position

The ease of starting the low-weighted Stutz and Blackhawk car from a standstill on an upgrade, by making it unnecessary to apply the brakes to keep the car from rolling backward, is appreciated by men and women drivers in all localities.

A brief technical description of the Noback and its functions follows:

The small compact unit is mounted at the rear of the transmission. The housing is bolted directly to the transmission case and the internal parts are contained in a roller container, which floats on five bosses inside of the housing. The internal parts consist of the following, the locking hub, ground concentric and mounted on the splines of the transmission main shaft, the locking wedge which rests against the inside of the roller container and is held in position by the push rod; the locking roller, which is held in a relative position to the locking hub between the locking hub and the locking wedge. The principle of the device is that the locking hub is automatically engaged by the roller container surrounding it over one-half of its circumference as soon as the vehicle begins to move backwards. Normally the roller container is held away from the locking hub by means of a compression spring, mounted between the Noback housing and the outside of the roller container. This spring seats the container against the bosses on the left side of the Noback housing, which provides a clearance between the locking hub and the roller container from .0025 to .005 in.



Noback released for backing

Engagement of the roller container with the locking hub is effected by means of the locking roller. This roller is held in position by a small spring loaded plunger, which tends to maintain the locking roller in its proper position between the locking hub and the locking wedge.

When the car is driven in the forward direction, the parts are as shown in the accompanying drawings,

namely, with the roller container spring holding the container away from the locking hub in order to relieve the frictional drag.

The action of these parts when the car starts to roll backward is accentuated by the frictional drag between the locking hub and roller. When the locking hub starts to rotate in the reverse direction, it moves the locking roller downward against the increasing angle of the locking wedge, which forces the roller container against the locking hub, applying a very effective brake.

The car will be held in this position until the gear shift is placed in the reverse position, permitting the car to be backed up, due to the release of the Noback, as described below, or until the car is moved forward. Immediately the car is moved forward the locking roller moves upward to its normal running position, and the roller container spring forces the roller container away from the locking hub, permitting it to rotate freely.

When the gear shift is moved to the reverse position, the release pinion rack, mounted at the top of the Noback housing, is operated by the reverse shifting bar, and the movement of this rack is transmitted through linkage to the release cam, on which the lower end of the push rod rests. Normally the high side of this cam is against the push rod, but immediately the gear shift is placed in the reverse position, the cam is rotated so that its low side bears against the push rod, permitting the push rod to drop approximately 3/16 inch. Immediately this occurs, the locking wedge drops and permits the locking roller to drop below the center of the locking hub. In his position it is impossible for the locking roller to overcome the resistance of the roller container spring and the locking hub is free to rotate in the reverse position.

The roller remains in this position even though the gear shift is moved to neutral, or any of the forward speed positions until the car is actually moved forward; then the locking roller is frictionally picked up by the locking hub relieving the slight pressure against the locking wedge and permitting the spring in the release linkage to rotate the cam so that its high point bears against the push rod. This leaves the Noback in an operative position.

High-Speed Cutting Alloy

THE Cleveland Automatic Machine Co. announces a new high-speed cutting alloy with hardness little less than that of the diamond, which it proposes to market through its extensive connections with the machine tool trade. The alloy is known as Camite.

In contrast with other recently announced tool materials, Camite is a strictly American development, with distinctive composition and produced by a distinctive process. Credit for its development goes entirely to Emanuel Lavagnino, an American chemist, with a background of Italian metallurgical training. The development work was done in the laboratory of the Electro-Alloys Co., which is closely allied with the Cleveland Automatic Machine Co.

Among the claims for Camite is a degree of toughness difficult to realize in a material of such extreme hardness. Camite resists the shocks of handling to a surprising degree for a material of its class.

Camite is furnished in the form of platens in definite stock sizes, or special sizes and shapes are furnished to order. The platens are attached to suitable shanks or tool holders by brazing and ground to a cutting edge. Directions for brazing and grinding, with special grinding wheels, are furnished by the Cleveland Automatic Machine Co.

Camite is marketed with claims of practically unlimited cutting speed, so far as existing types of equipment are concerned. The stimulus to machine design, now that cutting speed ceases to be a limiting factor, can be readily seen. But its advantages are not confined to making greater speed with customary tool feeds. Cuts of two or three times the customary depth have been made in long test runs without detriment to the tool. It successfully accomplishes intermittent cuts under severe conditions. While a degree of caution is advisable in handling a material of such extreme hardness, tests with tools held at normal (and super-normal) distances from the cutting edge have been accomplished with entire success.

American-made cars were pronounced favorites during the recent International Automobile Show at Geneva, Switzerland. The view above pictures the displays of at least nine American models in the great salon.

First with the News

Reliable, Accurate

News of the Industry

PAGE 636 VOLUME 60 *Philadelphia, Saturday, April 20, 1929* NUMBER 16

Chrysler Decides to Share Profits

Directors Reelected at Annual Meeting; Increased Shipments Reported

DETROIT, April 18—Stockholders of the Chrysler Corp. at their annual meeting here this week approved the bonus and profit-sharing plan for executives and employees which had been approved previously by the board of directors in New York. While no details of the plan have been revealed by the company, it is understood to involve the provision of a substantial stockholding interest in the Chrysler companies for the benefit of the organization, in addition to a profit-sharing arrangement.

All directors of the corporation were reelected. Walter P. Chrysler, chairman of the board, announced that, while final figures on earnings for the first quarter were not yet available, they would exceed considerably, on a profit-sharing basis, earnings for the corresponding period last year. All plants are scheduled for five full days a week operation with many departments working overtime.

It was announced that Chrysler shipments in the first quarter were 122,758 cars, compared with 112,977 shipped by both Chrysler and Dodge in the first quarter last year. Plymouth shipped 22,696 units compared with 23,076 in the first quarter last year. Shipments of the new Dodge cars during the quarter totaled 42,000, of which 18,000 were in March.

Bostick's Body Found

DETROIT, April 18—The body of Capt. Vern E. Bostick, formerly purchasing agent of the Wills Ste. Claire Motor Car Co., who disappeared last November while duck hunting, was found on the beach of Lake Erie, near Port Clinton yesterday.

New Airplane Firm Hinted

CINCINNATI, April 17—Officials of the Crosley Radio Corp. today indicated that if the company should enter the airplane manufacturing industry such a project would be taken up by a separate firm.

Secretary Lamont Denies Press Rumor

WASHINGTON, April 18—Secretary of Commerce Lamont denied this week that there is to be any inquiry in regard to the so-called rubber pool. The denial was made following publication by a wire service that the Department had begun "an informal inquiry within the Department" into the status of the American reserve for crude rubber, organized several years ago during the reign of foreign monopolies. The "rumor" was explained by the Department as a misunderstanding at the weekly press conference between Secretary Lamont and newspaper men.

Meeting is Planned for German Tax Commission

NEW YORK, April 18—The German Tax Commission to study American gasoline tax which arrives here April 22 will have two-day meeting at National Automobile Chamber of Commerce headquarters, April 24 and 25.

Among the speakers will be John N. Willys; H. H. Rice, General Motors; F. G. Crawford, tax authority of Syracuse University; William L. Dill, Motor Vehicle Commissioner of New Jersey; A. R. Williams, The Texas Co.; G. C. Woodruff, New York Central; John F. Deasy, Penna. R. R.; F. G. Murdock, Capitol Theatre Bus Terminal; L. H. Palmer, Fifth Ave. Coach Co., and Arthur P. Warner, Public Service Corp. of New Jersey.

Blackburn Views Detroit

DETROIT, April 18—The Blackburn Airplane Corp., Ltd., of England, a $10,000,000 company, may soon begin the manufacture of airplanes in Detroit, according to A. R. Martine, of New York, president of the American Blackburn Corp., subsidiary. Major F. A. Bumpus, chief engineer, and Capt. A. M. Blake, chief pilot, are investigating possible sites in this city, Martine said.

New York Situated Well for Aircraft

Keys Analyzes Ideal Plant Needs for Statewide Economic Congress

NEW YORK, April 17—The prime requisites of locating a plant for the manufacture of aircraft or aircraft engines are readily available power and labor, accessibility of sources of supply, suitable transportation facilities, easily available facilities for the machining of tools and favorable legislative and regulatory conditions, C. R. Keys, vice-president of Curtiss Airplane & Motor Co., told the New York Statewide Economic Congress at its closing session here this afternoon.

In many of these respects New York State, particularly the "up-state" section, is as well off as any other locality but in some respects New York is not as favorably situated as others, Mr. Keys continued. Metropolitan New York, being in itself one of the sources of machine tooling operations and being fairly close to New England, which is one of the other centers, is particularly well situated as far as availability of new tools is concerned. In this respect it is much better off than Detroit or Cleveland, the other machine tooling centers. As far as availability of the labor supply is concerned, New York is fairly favorably situated, although New England has the advantage in some ways in this respect, Mr. Keys pointed out.

U. S. Rubber Elects

NEW YORK, April 17—United States Rubber Co. at its annual meeting yesterday elected nine new directors, five of whom take the place of retiring members and four being added to the list. The new directors are Edward J. Coughlin, Victor M. Cuttre, William de Krafft, James Deshler, Percival Dixon, H. S. Miller, Herbert E. Smith, Lewis L. Strauss and Lucius D. Tompkins. Members of the board who retired at this meeting are John W. Davis, Henry L. Hotchkiss, Samuel M. Nicholson, Homer Sawyer and Charles B. Seger, former president and chairman. Other retiring directors were reelected.

Erskine Puts Color Before Body Design

Emphasizes Importance of Attractive Hues, in Conference Address

ST. LOUIS, April 17—Color is more important than lines or shape in body design, in the opinion of A. R. Erskine, president, Studebaker Corp. of America, who talked on automobile style and design selling before the Mississippi Valley Manufacturers and Wholesalers Conference here today.

"The car of passable lines and commonplace body will sell if it is painted in attractive colors," Mr. Erskine said, "while a car of graceful lines and shapely body will not sell if it is finished in an ugly color." Commenting that "style is a fickle jade," Mr. Erskine went on to voice the belief that "style setting is risky business" and that "style won't stay put." "The suspense is killing," he said, "and yet one must either be a leader or a follower." Beauty is a necessary element in any automobile that is to sell successfully today, however, Mr. Erskine emphasized. Consequently all big automobile manufacturers and body makers maintain art departments and have outside expert advisors on style.

William B. Stout, president Stout Metal Airplane division, Ford Motor Co., was another automotive speaker at the conference. Mr. Stout reviewed the progress of the airplane industry in the last two years and predicted that within five years there will be 100,000 privately owned airplanes in the United States. Important changes in design and construction will be made within the next two years, he said.

New Company Organized by Gotfredson Employees

TORONTO, April 17—Trucks and Parts, Ltd., has been organized by five former employees of the Gotfredson Corp., Ltd., which recently passed into a receivership, as an independent firm to continue the manufacture of Gotfredson trucks in Canada and to provide service for trucks now in use. While the names of the men heading this project have not been disclosed, it is announced that the new company has the backing of the Canadian Bank of Commerce and the National Trust Co., both of this city. The new firm has announced that it has no connection with the Gotfredson interests in the United States.

M. and E. A. Will Conduct Chicago Events Together

NEW YORK, April 16—The Executive Committee of the Motor & Equipment Association has decided that the Annual Business Exhibit and Convention of the organization will be held simultaneously at the Chicago Coliseum, Nov. 4 to 9. This plan follows that of the former Automotive Equipment Association, now merged into the M. & E. A.

The Executive Committee approved holding both events under one roof upon the recommendation of the Sales Development Committee, whose members were unanimously of the opinion that closer contact would thus be brought about between manufacturers and wholesalers. Group and committee meetings will be held at the Stevens Hotel, which will be official headquarters.

Pierce-Arrow Announces Six Custom-Built Models

BUFFALO, April 20—The Pierce-Arrow Motor Car Co. today announced a group of custom de luxe models, created for the new 143-in. straight-eight chassis by the American builders—Willoughby, Brunn, Judkins, Holbrook and Dietrich.

The new group comprises six distinct models; a convertible victoria, five-passenger, by Brunn, $7,175; a convertible sedan, five-passenger, by Dietrich, $7,175; an enclosed drive limousine, seven-passenger, by Judkins, $7,000; a sedan limousine, five-passenger, by Holbrook, $6,800; the all-weather town cars, five-seven passenger, by Willoughby, $6,800 and $7,000, and the all-weather cabriolet, five-seven passenger, by Willoughby, $6,900. These prices are all f.o.b. factory.

Robbins Body to Merge

INDIANAPOLIS, April 18—Forty Chicago brokers are to inspect the properties of the Robbins Body Corp. here today preparatory to the merger into the United States Radio & Television Corp. It is reported that the Continental Bank, Chicago, will handle the financing of the $5,000,000 radio corporation, issuing stock shares of a par value of $20 each.

Gardner to Make New Six

CHICAGO, April 17—Russell E. Gardner, president of the Gardner Motors Company, announces that his company will bring out at an early date an entirely new line of big sixes, comparable to present eights in appearance, with a wheelbase of 120 inches. The new big six will be priced in the $1,000 field, and marks a deviation of the company from its policy of manufacturing.

Graham-Paige Net High

DETROIT, April 17—The Graham-Paige Motors Corp. has reported earnings for the first quarter of 1929 as $523,641, or more than double the earnings of the first quarter last year, which were $257,783. Directors of the company have voted to offer holders of common and second preferred stock the right to subscribe pro rata to 283,758 shares of no par value common stock at $25 per share.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES.

NEW YORK, April 18—Despite the drawbacks to trade in the form of storms, floods and unfavorable temperatures during the first quarter of the year, retail trade in that period reached new high levels for all time. Business in general during the last week has been maintained at very satisfactory levels.

FREIGHT CAR LOADINGS

Car loadings for the week ended March 30 totaled 967,029 cars, which marks an increase of 18,286 cars over those in the corresponding week last year but a decrease of 19,433 cars below those in the corresponding week in 1927. Loadings for the first three months of 1929 totaled 12,146,680 cars, as compared with 11,792,196 cars for the corresponding period in 1928 and 12,541,125 cars for the corresponding period in 1927.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended April 13 stood at 97.3, which compares with 97.9 the week before and 98.3 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City for the week ended April 10 were 7 per cent above those in the corresponding week last year.

FEDERAL RESERVE STATEMENT

The decrease in brokers' loans was accompanied by a decline in holdings of discounted bills by the Federal Reserve banks which, according to the consolidated statement of the Reserve banks for the week ended April 10, showed a decline of $66,000,000. Holdings of bills bought in the open market decreased $18,000,000 and holdings of Government securities $3,000,000. The Reserve ratio on April 10 was 73.8 per cent, as compared with 71.5 per cent a week earlier.

Bohn Earns $1,019,753

DETROIT, April 16—Bohn Aluminum & Brass Corporation reports net profit of $1,019,753 after all charges and Federal taxes, equivalent to $2.91 a share earned on 350,489 shares of no par capital stock, for quarter ended March 31, 1929. This compares with $818,091 or $2.34 a share on 350,000 shares for corresponding quarter in 1928.

Burst Announces Cab Deal

ST. LOUIS, April 17—C. W. Burst, president of the Moon Motor Car Co., and of the Windsor Corp., has announced that his organization will manufacture a large fleet of taxicabs for the Diamond Cab Co. of New York.

Secretary Lamont Opens Convention

Points Out Possibilities of Car Sales in India and China

BALTIMORE, April 17—"A foreign market for 140,000,000 automobiles would be created if the 450,000,000 people of China and the 250,000,000 inhabitants of India were to attain an economic status like that of the citizens of the United States, one of every five of whom owns a motor car," Secretary of Commerce, Robert P. Lamont, stated today in speaking here at the opening session of the 16th National Foreign Trade Convention. His subject was "World Trade Today and Tomorrow."

Mr. Lamont said the statement was a bit fantastic but he pointed out that it illustrated the foreign market possibilities that are being opened to the United States and the world by the steady progress being made by China and India, and the other so-called backward countries.

"Suppose we should continue to be the world's chief purveyor of motor vehicles," Secretary Lamont went on to say, "how many of Detroit's motor plants would it take to supply such a demand?"

The Secretary said that the value of overseas shipments of machinery is now more than eight times as great as the end of the last century, while the automobile is a wholly new item.

In speaking of the automotive industry, Senor Don Carlos G. Davila, Ambassador to the United States from Chile, said: "If, as the philosopher says, he is a benefactor of humanity who makes two blades of grass grow where one grew before, what could then be said of you who are producing 500,000 automobiles a month, where only a short time ago but 1000 a year were produced?"

"Calculating upon the figures of the last 50 years," continued the Ambassador, "one could estimate that the United States in 1978 will have 360,000,000 inhabitants. Its natural wealth will be more than one thousand billion dollars; its foreign commerce, which today is $9,000,000,000 will have reached $27,000,000,000 and its production of automobiles, to refer to a typically American industry, will have reached 18,000,000 cars annually, if they have not been replaced by airplanes."

Sterling Sales Increase

MILWAUKEE, April 17—Deliveries by the Sterling Motor Truck Co., Milwaukee, for the first five months of the fiscal year beginning Nov. 1, 1928, were 80 per cent above the same period a year ago, it is announced. March was the largest month in the company's history, with orders running 15 per cent in excess of deliveries.

Urge Plane Makers to Shield Engines

WASHINGTON, April 18—Responsibility for shielding airplane engines against electrical disturbances which interfere with radio installations in planes rests with engine manufacturers, it is stated in a resolution adopted this week by the National Advisory Committee for Aeronautics. Progress in the installation of radio telegraphy, telephony and directive beacons for aircraft makes shielding of motors generally a matter of necessity, the Committee pointed out.

Ohio Counties Show Higher March Sales

COLUMBUS, OHIO, April 16—The Ohio Council of the National Automobile Dealers Association, in a bulletin covering sales of new passenger cars during March reports that sales in the eight most populous counties of the state during the month were almost 60 per cent higher than those of February. The total March sales in the eight counties were 15,219, compared with 9586 in February.

In Coyahoga County (Cleveland), March sales were 5529 compared with 3537 in February; Hamilton County (Cincinnati), March sales 1982 compared with 1230 in February; Summit County (Akron), 1381 compared with 619; Lucas County (Toledo), 1740 compared with 1028; Franklin County (Columbus), 1528 compared with 948; Mahoning County (Youngstown), 789 compared with 533; Stark County (Canton), 968 compared with 904, and Montgomery County (Dayton), 1208 compared with 787 in February.

Total March sales in the eight counties were 15,219 compared with 9586 in February.

Chevrolet Bill $46,000,000

DETROIT, April 16—The freight bill of the Chevrolet Motor Co. for 1928 was more than $46,000,000, according to C. R. Scharff, general traffic director. The bill represented inbound and outbound shipments for 16 domestic plants, and covered the movements of 272,368 carloads of freight.

Junk Ring Prices Reduced

BALTIMORE, April 15—The American Hammered Piston Ring Co. announce a reduction in the list price of Junk Rings used in Knight engines.

Effective April 12, Junk Rings up to and including 3 15/16 in. in diameter, will list at $1 each and Junk Rings 4 in. and up at $1.50 each.

Borst Engineering Formed in Buffalo

New Firm to Begin Production of Rubber-Cushioned Spring Shackle

BUFFALO, April 17—The Borst Engineering Corp., capitalized at $150,000, has been formed in this city to manufacture and distribute the Borst cushioned-in-rubber spring shackle. A. J. Borst, Jr., inventor of the appliance bearing his name, is president of the new company. Officers and directors, all Buffalo men, include Samuel A. Stephens, Shelton J. Ingram, Wilbur F. Groom, William F. Watterson, Harold C. Coppins, Walter A. Yates, Harry G. Burber and Albert F. Reidl.

The Buffalo-made shackles, recently patented, have passed a number of commercial tests and are being considered as standard equipment by a number of leading automobile manufacturers, it is said. Already several taxicab companies have adopted them.

A new factory has been acquired and in the near future it is believed production will reach considerable volume. The principle of the Borst shackle, as described by its inventor, is the adaptation of a rubber cushion to absorb the road jars which travel up to the spring. The Paragon Sales Co., Buffalo, has been appointed local distributor of the product.

Timken Roller Earnings Up

CANTON, April 17—The Timken Roller Bearing Co., at its annual meeting here yesterday, reported net earnings for the first quarter, 1929, as $4,264,225. This is the first year for the company to make quarterly reports. Heretofore it has reported semi-annually. The statement just issued indicates increased business over last year, when earnings for the first six months were $6,395,571. Directors chosen yesterday include: H. H. Timken, W. R. Timken, M. T. Lothrop, J. C. Obermier, J. F. Strough, J. W. Spray and A. C. Ernst.

Reeves Discusses Insurance

ALBANY, April 19—Speaking before the Rotary Club here today, Alfred Reeves, general manager of the National Automobile Chamber of Commerce, emphasized the advantages of the moral hazard in liability insurance, pointing out that while experience in compulsory insurance has not yet been sufficient to draw definite conclusions as to its advantages or disadvantages there was strong presumptive evidence that such insurance tends to make irresponsible drivers less careful.

Maryland Sales Increase

BALTIMORE, April 15—April new car sales during the first 10 days in Maryland were 45 per cent greater than in the corresponding period last year.

Reo Board Reduced to Seven Members

Stockholders Reelect Olds and Scott; Triphagen Retires as Director

LANSING, April 17—Stockholders of the Reo Motor Car Co., at their annual meeting yesterday, elected a seven-member board of directors in place of the former board of eight members. C. A. Triphagen, formerly sales manager, was the retiring member. The board reelected R. C. Olds, chairman; R. H. Scott, president; H. T. Thomas, vice-president, and D. E. Bates, secretary and treasurer.

For the first time in Reo's history of 24 years, Mr. Olds, founder of the company, did not preside at the meeting. Mr. Scott was in charge. It was explained that Mr. Olds had returned to Florida where he is building a new residence. C. E. Eldridge, general sales manager, reported that about 200 new dealers have joined the company in the last eight months.

Net earnings for the year ended Dec. 31 were reported as $5,083,588, as compared with $4,724,301 for the previous year. After dividend requirements, the company closed its year with earned surplus totaling $11,295,661 and capital surplus of $472,509, making total capital and surplus $31,768,170. Total current assets were reported as $25,761,403, as compared with total current liabilities of $5,515,979.

Confirm Implement Merger

CHICAGO, April 17—Rumors that a new company will be formed to take over the business of the Minneapolis Steel & Machinery Co., the Moline Implement Co., and the Minneapolis Threshing Co., were confirmed this week by W. C. MacFarlane, president of Minneapolis Steel. The combination of the three companies will result in the offering of a complete line of farm implements. Details of the new organization are expected to be announced soon.

Tool Company Formed

INDIANAPOLIS, April 17—The L. S. Guetti Tool Co., with a manufacturing pant in this city, has been formed. Production of all kinds of high speed cutting tools and stellite gages will be begun at once. The company was organized by L. S. Guetti, formerly of the Haynes Stellite Co. of Kokomo. It will employ 100 tool and gage makers.

Chamber to Discuss Traffic

NEW YORK, April 16—Traffic of the City and its Trade Area is to be the discussion at the United States Chamber of Commerce meeting in Washington on May 11 under the chairmanship of A. J. Brosseau, president International Motor Co. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, will lead the discussion at this meeting, during which the following specific topics are to be discussed.

Progress of Car Market in Australia Explained in U S. Official's Report

WASHINGTON, April 16—Australia was the best market for exported American trucks and buses during 1928, taking about one-eighth of the number exported, and was the third best market for passenger cars, taking about one-tenth of the exports, according to figures compiled by Charles F. Baldwin, assistant U. S. Trade Commissioner at Sydney, Australia, and published as a special report on "The Automotive Market of Australia" by the Bureau of Foreign and Domestic Commerce, as trade information bulletin No. 611.

In 1928 the United States shipped to Australia 33,352 passenger cars valued at $23,474,735; 17,305 trucks and buses valued at $8,359,294; and parts for replacement, servicing, and accessories to the value of $4,464,076. Approximately three-fourths of the automobiles registered in Australia are American, the report states.

"At the present time Australia offers possibilities not surpassed by any other overseas (automobile) market," says the report. "With an area larger than that of the United States proper, and a population of only about 6,250,000, it has already absorbed approximately 500,000 passenger cars and trucks, and that total is only a fraction of what will be required with the development of the country and the consequent increase in population.

"The country is already highly motorized; its ratio of one car for every 14 inhabitants at the beginning of 1928 was surpassed only by the United States, Canada, and New Zealand. In one state, South Australia, there is one car for each six inhabitants. Australia has become very definitely 'motor conscious,' the American automobile having been both a cause and a result of a development of that attribute."

Studebaker Truck Sales Up

SOUTH BEND, April 19—Commercial car sales of the Studebaker Corp. of America during the first quarter of 1929 increased 93 per cent over the same period of last year, A. R. Erskine, president, stated today. A large portion of this increase he attributed to sales of the new straight eight bus introduced in January.

Test Mich. Screw Engine

WASHINGTON, April 18—A new type of inverted, four-cylinder-in-line, air-cooled aviation engine, submitted by the Michigan Screw Co., Lansing, Mich., is undergoing official tests at the laboratory of the Bureau of Standards, it was announced this week. The engine is being tested for the issuance of an approved engine certificate. The Alliance Aircraft Corp. also submitted a new type of aircraft motor which will be tested when tests on the Lansing engine are completed.

Hercules Unit Producing

CANTON, April 16—The new plant addition of the Hercules Motors Corp. here is now in full operation and the company is turning out between 2500 and 3000 engines monthly, a large majority of which go to the automotive industry.

Durant Making 300 Daily

DETROIT, April 18—Durant Motors, Inc., are manufacturing approximately 300 automobiles a day at the Lansing plant. It is reported this will be speeded up soon to meet the demand for Durant cars and trucks.

Relay Motors Extends Line of Light Trucks

LIMA, OHIO, April 17—Relay Motors Corp. recently enlarged its line with the introduction of 1 and 1½-ton models, known as Models 20B and S11B, which incorporate the Relay axle. Both models are similar, being equipped with six-cylinder engines, four-speed transmissions and four-wheel internal brakes hydraulically operated; they differ only in frame size, rear axle ratios, number of leaves in springs, number of tires and in wheelbase.

Model 20B is available in a standard wheelbase of 142 in. with body allowance of 1000 lb. and a chassis weight of 4100 lb., while Model S11B is offered in two wheelbase lengths, namely, 162-in. standard and 142-in. short with a body allowance of 1500 lb. and a chassis weight of 4500 lb.

The Relay axle, it will be recalled, has a spiral bevel driving gear on the differential at the center, with internal gears and pinions in the wheels. The wheels support a dead axle on two roller bearings. All weight is supported by a large member fastened to the outer ends of the live axle housing and to the springs, the upper end of the member being secured to the springs. Drive is taken through radius rods.

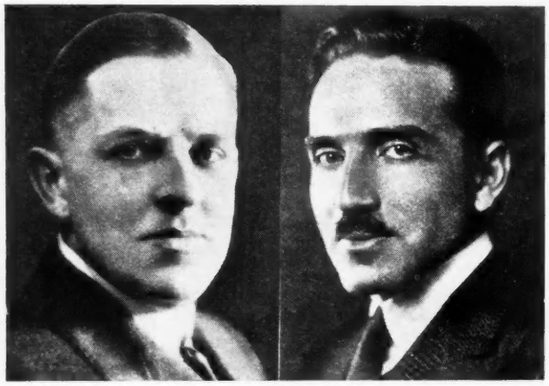
Tropic-Aire Adds to Line

MINNEAPOLIS, April 16—Edmund Burke, vice-president and general manager of Tropic-Aire, Inc., of this city, has announced that the company's production will be several hundred per cent greater than that of 1928. Two new models have been added to the company's line, a Junior heater for coupes and other small closed cars, and a model designed to meet the requirements of the Model A Ford car.

Men of the Industry and What They Are Doing

Heads of Studebaker-Pierce-Arrow Export Corp.

P. G. Hoffman (left) and H. S. Welch (right) have been elected chairman of the board and president, respectively, of the new Studebaker-Pierce-Arrow Export Corp., the organization of which was announced in Automotive Industries last week. The export company, with headquarters at South Bend, will conduct the overseas business of both companies



Federal Board Scored by Durant, Before Trip

Before leaving for a six weeks' trip through Europe, this week, W. C. Durant extended his criticism of the Federal Reserve Board for its attitude toward brokers' loans, in a radio address. Mr. Durant announced that 463 of 500 industrial leaders in 20 cities had replied to his recent questionnaire and only 12 upheld the Board. He suggested to the Board three steps to aid the current market: Reduction of the rediscount rate to 3 per cent, return of $700,000,000 which he said the Board's strategy had withdrawn from the money market, and to halt issuance of any securities which the Board was unwilling to have member banks accept as collateral.

Mr. Durant explained later in the week that he would spend most of his time while abroad in Germany and France.

Campbell Ships "Bluebird"

Captain Malcolm Campbell has shipped his racing automobile, "Bluebird," to the Zak River, South Africa, to be taken by motor truck to the Verneuk Pan for an early attempt to break the world's automobile speed record of 231 m.p.h. set by Major Segrave.

Kerby Elected President

D. Roy Kerby has been elected by the shareholders as president of the Durant Motor Co. of Canada, Limited, with headquarters at Leaside, Ontario. Mr. Kerby has been managing director of the Canadian Durant. He was formerly with the Olds and Chevrolet Divisions of General Motors of Canada, Ltd.

De Vaux Returns West

Norman De Vaux, president of the Durant Motor Co. of California, has returned to Oakland after spending two days in conference with executives of the parent company in Detroit. Mr. De Vaux accompanied F. J. Haynes, president of Durant Motors, Inc., on the latter's recent return from a three weeks' trip through the West.

Westinghouse Names Directors

Stockholders of the Westinghouse Electric & Mfg. Co. reelected J. D. Callery, P. D. Cravath, H. P. Davis, and Harrison Nesbit directors for the term expiring in 1933. H. B. Rust was elected a director of the class whose terms expire in 1931. A. W. Robertson, chairman of the board, was elected a director of the class whose terms expire in 1932.

Kraut Elected President

The controlling interest of the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., formerly owned by the Rueping Estate, Inc., and F. J. Rueping, has been taken over by H. B. Kraut and a group of associates. Mr. Kraut was recently elected president and chairman of the board.

Kauffman Succeeds Moore

Ray Kauffman, president, Accurate Gear Co., Springfield, Ohio, has been named to succeed T. J. Moore as a member of the National Standard Parts Association Merchandising and Standardizing Committee.

Macauley Returns from Trip

Alvan Macauley, president of the Packard Motor Car Co., and president of the National Automobile Chamber of Commerce, and Mrs. Macauley, have returned to Detroit following a visit at Savannah, Ga.

Nash Appoints Seaman

The appointment of Harold H. Seaman as president of the Seaman Body Corp. of Milwaukee, which is affiliated with the Nash Motors Co., to the board of directors of Nash Motors, has been announced by C. W. Nash.

Allen Gives "Y" $25,000

Floyd A. Allen, assistant to the president of General Motors, has donated $25,000 to the Flint (Mich.) Y. M. C. A. for the building of a lodge on Lake Copeneconic. This gift follows the recent donation by the Fisher brothers to the Y. M. C. A. of Detroit, which is building a branch building in their honor.

Marquette Tool Names Kauderer

Charles Kauderer has been appointed Michigan sales engineer for the Marquette Tool & Mfg. Co. Mr. Kauderer, who for the past 25 years has been connected with the Fisher Body Corp., Mullins Mfg. Co., and Briggs Mfg. Co., will have his headquarters in the General Motors Building, Detroit.

Read Becomes Sales Manager

Joe Read, long associated with the Moon Motor Co., has been appointed sales manager of the airplane division of the Universal Aviation Corp. He was recently with the Midwest Motor Co., St. Louis.

Autopulse Names Malotte

P. A. Kempt, president and general manager of the Autopulse Corp., has announced the appointment of W. L. Malotte as sales manager of the standard equipment division of the company. Mr. Malotte, who came to Autopulse from the Hannum Mfg. Co., Milwaukee, has been identified with the automotive industry for 17 years.

Cleary in New Post

John Cleary, formerly advertising director of the Cadillac Motor Car Co. and the Peerless Motor Car Co. and until recently Editor of *Motor Age*, has joined the Eugene McGuckin Co., Philadelphia advertising agency.

Burch Succeeds Gilpin

The H. H. Franklin Mfg. Co. has announced the appointment of Frank Burch as manager of its quality department to succeed B. H. Gilpin, who has resigned to become service manager for Pratt & Whitney Aircraft Co.

Sloan Joins Slade

The Slade Asbestos Corp., New York, has announced that Phil W. Sloan, for many years with the Timken Detroit Co., has joined its organization as sales engineer.

Marmon Names Harding

Thomas E. Jarrard, general sales director of the Marmon Motor Car Co., has announced the appointment of Sam V. Harding, long associated with the company, as sales promotion manager with headquarters at the Marmon factory.

Superior Steel Corp. is in New Control

Identity of Purchasers Withheld; Present Management to Continue

PITTSBURGH, April 16—Transfer of controlling interest in the Superior Steel Corp. to a new group consisting of New York, Binghamton, N. Y., and Pittsburgh interests is admitted by officials here although the identity of the group has not been divulged. It has been announced, however, that the present management will be continued in office. Control was obtained, it is reported, through purchases in the open market and by agreement with certain of the larger stockholders.

Largely as a result of unprecedented demand from the automobile industry, the company's earnings have advanced to an estimated $10 per share for the last year. The plants at Carnegie last month went on two turns per day. Earnings in January and February were above $50,000 each month and are estimated to run higher in March and April.

The company reports large orders for new rustless iron strips, consisting of 40 per cent copper and 60 per cent ore, made by a patented process. Frank R. Frost, president of Superior, recently was elected a director of the Rustless Iron Corp., bringing closer relationship between the two companies. Stockholders of Superior recently voted to increase the stock from 100,000 to 115,000 shares.

Motor Products Earnings for Quarter are $932,474

DETROIT, April 16—For three months ended March 31, 1929, Motor Products Corp. reports net profit of $932,474 after all charges and federal taxes, equal to $7.15 a share earned on 130,406 shares of no par common stock. Company did not issue a first quarter report last year but for the five months ended May 31, 1928, reported net profit of $922,765 after charges and federal taxes.

After allowing for quarterly dividend on 30,614 no par shares of $5 preferred stock outstanding Dec. 31, 1928, first quarter earnings of $932,474 after charges and Federal taxes are equal to $6.86 a share earned on 130,406 shares of no par common.

Transue Williams Reports

ALLIANCE, OHIO, April 17—The Transue Williams Co. reports a profit of $50,676 for March quarter after all charges against $63,547 in 1928 quarter. This concern has been working day and night on forgings for the automotive industry, and recently acquired contracts which insure steady operation of the plants for several months, it is said.

Financial Notes

Budd Wheel Co. has called a special meeting of stockholders for May 24 to vote on a proposal to increase common stock to 1,000,000 shares from 300,000 no par. Authorized preferred stock will remain unchanged at 15,000 shares of $100 par value. No definite financing plan has been announced but it is understood that the company may split its outstanding common stock and that a definite allotment may be made to raise new capital.

Houdaille-Hershey Corp. reports that for the fiscal year ended Dec. 31, 1928, the net earnings of its units were $2,231,432.36 after all charges including Federal taxes. These earnings equal more than five times the dividend requirements on the Class "A" stock. After allowing for the $2.50 a share cumulative dividend on the 173,637 shares of Class "A" stock outstanding at the close of 1928, there remained net earnings equivalent to $6.88 per share on 260,863 shares of Class "B" stock then outstanding.

Pioneer Instrument Co. had a gross income from sales of navigational instruments and airplane equipment during 1928 that was 80 per cent greater than in 1927, according to Charles H. Colvin, president. Sales for the first quarter of 1929 were greater than for the first five months of 1928, March alone netting 30 per cent more business than in any other month in the history of the company.

Wire Wheel Corp. of America reports net profit for 1928 after all charges as $939,428, equivalent after preferred dividends to $1.96 a share on outstanding common stock. This compares with $608,368, or $11.96 a share, on stock outstanding at the end of 1927. This would have been equivalent to $1.27 a share on stock outstanding at the end of last year.

Curtiss Aeroplane and Motor Co. reports revenues for the first quarter of the current year as $1,293,051 which compares with $1,496,923 in the corresponding period of last year. A total of 147 engines and 44 planes were sold during the quarter, compared with 56 engines and 82 planes in the first quarter of 1928.

Eaton Axle & Spring Co. reports net profit for quarter ended March 31 after all charges except Federal taxes as $533,025. This compares with $315,320 for the corresponding quarter of 1928. Estimating Federal taxes, net income would be approximately $469,062, or $1.56 a share, on outstanding common stock. This compares with $272,752, or $1.09 a share, for the corresponding quarter a year ago.

Moto Meter Co. and subsidiaries report net profit after all charges for 1928 as $547,-392. This is equivalent to $2.73 a share on common stock and compares with $720,259, or $3.60 a share, on Class A stock, 1927. The National Gauge and Equipment Co. net income for 1928 was $260,076 as compared with $375,056 for the previous year.

Kelly-Springfield Tire Co. has called for redemption on May 10 its outstanding eight per cent serial gold notes. This redemption will be made at 110 and interest and will be effected through proceeds of common stock sold last November. Upon retirement of these notes the company will be without any funded debt. The notes were originally issued in an amount of $10,000,000, of which $3,221,700 are still outstanding.

Comet Engine Corp. has been organized in Delaware to acquire outstanding common and preferred stock of the Aircraft Engine Corp. of California, which manufactures a 150-hp., 7-cyl., radial, air-cooled engine. The new company has been financed by the Air Investors, Inc., and associates. The new corporation has been capitalized with 125,000 shares of no par common stock of which 60,000 will presently be outstanding.

Collins & Aikman Corp. reports net profit for the year ended February 28 after all charges as $1,905,555. This is equivalent to $1.85 a share on common stock. The previous report was for the period from June 1, 1927, to March 3, 1928, and showed an income for that period of $1,653,623, or $1.74 a share.

Chicago Pneumatic Tool Co. and subsidiaries report net profit for the first quarter of the current year before Federal taxes as $325,301. This is equivalent after preferred dividends to 80 cents a share on common stock and compares with $155,929 for the first quarter of 1928.

Ross Gear & Tool Co. reports net income of $245,531 for the first three months of this year, after charges including depreciation and taxes. This is equal to $1.63 a share on 150,000 shares of common stock and compares with $139,452 or 93 cents a share in the corresponding period of last year.

Arrow Aircraft & Motors Corp., recently organized to take over the business and assets of the Arrow Aircraft Co. and of the Patriot Mfg. Co., is offering 45,000 shares of no par common stock for public subscription at $12.50 per share.

Pratt & Whitney Aircraft Corp., a subsidiary of the United Aircraft and Transport Corp., reports net profit for the first quarter of the current year as $1,300,274. This compares with $337,012 for the corresponding quarter of 1928.

Elias Aircraft and Mfg. Co., recently formed for acquiring the assets of G. Elias & Bro., Inc., is offering 30,000 shares of no par common stock at $25 per share for public subscription.

Willys-Overland, Inc., has declared its regular quarterly dividend of 30 cents a share on common, payable May 1 to stockholders of record April 20.

Jordan Motor Car Co. reports net profit of $57,500 for the quarter ended March 31 after all charges except Federal taxes. Sales for this period amounted to $1,015,682.

General Tire & Rubber Co. has declared regular quarterly dividend of $1 payable May 1 to stockholders of record April 20.

Omnibus Corp. reports net profit for 1928 as $879,840 with total surplus at the end of the year as $1,117,568.

Industry Continues Demand for Steel

Car Makers Show No Sign Yet of Seasonal Drop in Orders

NEW YORK, April 18—Announcement on Monday by the leading producer that orders now on hand would carry subsidiary mills through to August, and that if business continued at the present rate, 1929 sales would reach the stupendous total of $1,500,000,000, served to emphasize still more the steel industry's prosperous condition. So far there is no sign of any decrease in the automotive industry's call for steel products. Sheet and strip mills are operating at capacity. Open-hearth equipment has been worked so strenuously that a good many units are in urgent need of overhauling and repairs.

Under the pressure of the insistent demand, the damage wrought a few weeks ago in Mahoning Valley plants by floods was repaired almost overnight, but the need of repairs made more and more urgent by the squeezing of every possible ton out of every turn and the approach of the season of the year when the thermometer's rise tends to cut down output, are conditions that can hardly be escaped and that will more or less offset a slowing down in specifications when it does come.

While much of the cold-rolled strip and cold-finished bars being shipped represents first quarter business, the volume of second quarter bookings has attained fair proportions, and some of these orders are already covered by specifications. Automotive alloy steels continue in good demand. Sales of bolts and nuts to automotive consumers have broadened. The market's price structure remains entirely unchanged, save that concessions on hot-rolled steel bars have disappeared, and the $1.95, Pittsburgh or Cleveland, quotation appears to have been fully established.

Pig Iron—While the demand from automotive foundries, mostly for nearby shipments and third-quarter contracting, is slow in developing, the rate at which foundries are melting iron is decidedly encouraging to sellers. The Michigan price continues at $20 for foundry and malleable, the Valley quotation remaining also unchanged at $18 for foundry and $18.50 for malleable.

Aluminum—Automotive demand, especially for piston metal, continues good. The sole domestic producer's 1928 report shows that operations last year increased 28 per cent, and it is sensed in the trade that the last few months have brought a further increase. Quotations remain unchanged.

Copper—Definite quotations on copper and brass products were not available during the early part of the week. The market for the red metal seems to be marking time, very little buying interest being in evidence pending development of a more definite trend.

Tin—Activity of the bear contingent on the London Metal Exchange is largely blamed for the lowest prices in five years which featured the market early this week. At the same time reports indicate that producers are striving to improve the metal's market position by further consolidations and cooperative marketing.

Lead—With the reduction of the leading interest's contract price on Monday to 7 cents, New York, a steadier tone and better consuming interest developed.

Zinc—The market is dull and unchanged in price.

Karl and Oettle Explain Opportunities for Sales in South America and Africa

NEW YORK, April 13 — Because practically all automotive jobbers in the Argentine are located in Buenos Aires there is close competition in and about that city and comparative neglect of the rich territory surrounding it at greater distances, said P. A. Karl, export manager of Brunner Mfg. Co., speaking at the monthly meeting this week of the Overseas Automotive Club, of which he is president. Mr. Karl recently returned from a trip through the Argentine, Uruguay and Brazil.

Another feature which he found noticeable in Buenos Aires, the speaker said, was the growth of domestic manufacture of accessories and equipment, many items of which are replacing American products. Mr. Karl found that the Uruguay market is largely dominated by Montevideo, and he indicated the belief that American manufacturers are not paying sufficient attention to that territory. Brazil he found to be well developed, with jobbers scattered. He explained that German manufacturers have made considerable marketing progress in that country, although he saw little chance of the United States losing her dominance in the field.

George S. Oettle, resident representative of the South African railways and of the South African government, said that out of 20 makes of automobiles registered in that country, 18 are American, representing 76 per cent of the total registration. Although United States bus and truck manufacturers dominated that market a few years ago, he said, there has been a marked tendency, during the last few months, toward such vehicles of British make. Mr. Oettle pointed out that South Africa presents good opportunities for the sales of motorcycles and he expressed the opinion that manufacturers of this country would do well to cultivate that market as such vehicles are very popular among the natives.

New Company to Make Crude Oil Fuel Device

MILWAUKEE, April 15—The Rector Gasifier Corp., Waukesha, Wis., has been incorporated with $300,000 capital stock by S. A. Perkins, chairman of the board of the Waukesha Motor Co., several associates, and local bankers, to engage in the manufacture of a device by which, it is said, crude oil may be employed as fuel in the ordinary gasoline engine.

It is the invention of Enoch Rector, of the Waukesha Motor engineering staff, and consists of a retort connected ahead of the carburetor which refines the crude oil. The new corporation will undertake its manufacture immediately, and plans the construction of its own plant within a short time. For the present it is the intention of making the rectifier only for the heavy duty engines.

Boeing Staff Increased

SEATTLE, April 15—The Boeing Airplane Co. has increased its engineering staff to 82 men, part of whom are engaged in research, bringing out new designs, improving models from a production and maintenance standpoint. The company's factory now has 58 projects, involving 69 planes of six different types, according to officials.

Accessories Head List in Employment Report

NEW YORK, April 16—In a list of 23 classifications of industry showing a gain in employment of 8.71 per cent numerically over a year ago, automobile accessories stand at the top with a gain of 44 per cent while automobiles rank second with 23 per cent. The figures were presented in the annual spring survey of the National Association of Manufacturers, announced by John E. Edgerton, president of the organization.

The survey, which embraces 1007 manufacturers throughout the country, shows that 565,132 persons are employed at present, as against 519,837 a year ago. Ranking third on the list showing increased employment is the machinery industry, with a gain of 14 per cent, while the electrical industry is listed fourth with a gain of 13.5 per cent.

Watson Gets Finland Post

WASHINGTON, April 18—Promotion of Osborne S. Watson of Blackshear, Ga., to commercial attache at Helsingfors, Finland, was announced by the Bureau of Foreign and Domestic Commerce this week. Mr. Watson is a former assistant chief of the Foreign Service Division of the Bureau and has served several years as trade commissioner in the Orient. Automobiles are near the top of this country's exports to Finland, the Department pointed out.

American Engineering Moves

NEW YORK, April 16—The American Engineering Co., whose products include the Taylor stoker and Lo-Hed hoists, announces a change in its office address in this city from 100 Broadway to 40 W. Fortieth St.

New Cooling Agent Effective in Tests

Ethylene-glycol Compound Tried in Water-cooled Plane Engines

WASHINGTON, April 15—Conjectures regarding the benefits to be derived from the new cooling process, utilizing ethylene-glycol, which were published in *Automotive Industries* for April 13, have been substantiated in all essential details by the announcement of the War Department regarding tests made with the process at Wright Field, Dayton.

According to the announcement, a recent standard 50-hr. test on a well-known type of engine, using the new cooling liquid at an outlet temperature of 300 deg. Fahr., did not reveal any serious defects as a result of this cooling system. At outlet temperatures above 300 deg. Fahr. a softening tendency of the rubber linings of the hose connections was sometimes noted, but at temperatures below 300 deg. the deterioration was very slow.

It is not at all unlikely, says the report, that many multi-engined planes of the future will increase their speeds 10 per cent, and their pay loads by several hundred pounds through the employment of the new cooling combined with wing radiators of minimum resistance.

While the new type cooling system is still in the experimental stage, service tests on the dynamometer and torque stand indicate that the Army Air Corps is fully justified in continuing research and development along this line.

Stutz March Sales Set New Record for Company

INDIANAPOLIS, April 16—Col. E. S. Gorrell, president of the Stutz Motor Car Co. of America, Inc., has announced that shipments from the factory in March were 87 per cent greater than in March, 1928, and that retail sales last month were 68 per cent greater than in February, exceeding any previous March.

April production will be probably 25 per cent greater than that of March, it was said. The company recently shipped a solid trainload of Stutz and Blackhawk cars to its Los Angeles distributor, the value of the shipment being nearly $100,000 with the average car price $3,600.

Crude Rubber Declines; Heavy Stocks Reported

NEW YORK, April 15—Crude Rubber prices have continued to decline with trading comparatively inactive, according to F. R. Henderson Corp. This inactive trading and price decline is said to be partly due to substantial increase in stocks on hand. Further uncertainty is caused by the lack of complete information on accumulation of stocks in the recently restricted areas which make accurate figures as to the available supply rather indefinite.

April consumption is variously estimated at from 40,000 to 48,000 tons, with the Henderson company favoring the lower figure. Stocks on hand in the United States at the end of March were 100,537 tons, an increase of 10,500 tons over the previous month, while stocks afloat were placed at 56,476 tons. Stocks in London increased last week to 28,934 tons. March arrivals in the United States amounted to 53,824 tons with arrivals from April 1 to April 12 estimated at 29,600 tons. Total probable arrivals for April are estimated at 62,000 tons.

Studebaker to Produce Eight New Open Models

SOUTH BEND, April 16—Eight new Studebaker touring car models, ranging in price from $1,350 to $1,645, will be put into production this month, according to an announcement today by A. R. Erskine, president of Studebaker Corp. of America. All will be built on the Commander chassis. First deliveries will be made in May.

Four of the open models will carry seven passengers and four will be of five-passenger capacity. The five-passenger models include two Commander sixes at $1,350 and $1,450; two Commander eights at $1,495 and $1,595. The seven-passenger models include two Commander sixes at $1,410 and $1,510, and two Commander eights at $1,545 and $1,645.

L Head for Buick's Car

DETROIT, April 15—The new six-cylinder car which the Buick Motor Car Co. will announce is to be equipped with an L-head engine, according to E. T. Strong, president and general manager. The car, which will not bear the Buick name although it will be manufactured entirely in Buick plants, will in no way affect the company's present line of automobiles which have long been known for their valve-in-head engines, Mr. Strong said.

Pierce-Arrow Adds Models

BUFFALO, April 15—The Pierce-Arrow Motor Car Co. has added three models to its straight eight line, a roadster priced at $2,875, a phaeton at $3,225, and a convertible coupe at $3,100. Each of the new cars is mounted on the 133-in. wheelbase. The engine develops 125 hp. and attains a speed of 85 m.p.h.

March Rim Output 2,613,389

CLEVELAND, April 13—Rim production in March advanced to a total of 2,613,389, compared to 2,423,457 in March, 1928, according to the statement of rims approved by the Rim and Tire Association of America, Inc. The output in February was 2,265,024 and in January, 1,835,207. The total for the first quarter, 1929, was 6,713,620, compared with 6,041,428 in the corresponding period of 1928.

Shipments of Tires Lower in February

Rubber Association's Report Shows Decrease in High Pressure Output

NEW YORK, April 16—Marked decreases in the shipment and manufacture of high pressure casings and tubes characterized the February business of tire manufacturers, according to the monthly report of the Rubber Association of America, Inc., which gives figures estimated to represent 75 per cent of the tire industry. Shipments of high pressure casings during February totaled 974,185 as compared with 1,461,104 in January of this year and with 1,244,812 in February of last year. Shipments of high pressure tubes were 1,800,676 in January of this year and 1,470,668 in February a year ago.

Although production also decreased in February, inventories show an increase over January, inventories of high pressure casings being 4,073,644 as compared with 3,651,041 in January and with 4,394,561 in February of last year. Inventories of high pressure tubes were 5,159,171 as compared with 4,734,477 in January of this year and with 5,941,626 in February of last year. As a result of the low shipment of high pressure tires, and in spite of comparatively large shipments of balloon tires, shipments of tires and tubes of all types showed a decrease in February as compared with January.

Total production of pneumatic casings of all types in February was 5,183,693 as compared with 5,041,530 in January and with 4,772,276 in February of 1928. Production of tubes of all types was 5,076,855 as compared with 4,887,932 in January and with 5,171,295 in February a year ago. Total inventories of all types increased.

		Inventory	Production	Shipments
PNEUMATIC CASINGS—ALL TYPES				
Feb.	1929	11,620,960	5,183,693	3,961,751
Jan.	1929	10,284,158	5,041,530	4,969,647
Feb.	1928	8,790,709	4,772,276	3,773,544
INNER TUBES—All TYPES				
Feb.	1929	12,749,141	5,076,855	3,958,257
Jan.	1929	11,539,495	4,887,932	5,431,255
Feb.	1928	10,987,647	5,171,295	4,073,030
BALLOON CASINGS				
Feb.	1929	7,472,592	3,796,660	2,976,698
Jan.	1929	6,583,958	3,470,596	3,499,121
Feb.	1928	4,173,493	3,021,548	2,500,013
BALLOON INNER TUBES				
Feb.	1929	7,572,752	3,675,116	2,908,406
Jan.	1929	6,805,018	3,347,660	3,630,579
Feb.	1928	5,046,021	3,221,756	2,602,362
HIGH PRESSURE CORD CASINGS				
Feb.	1929	4,073,644	1,373,691	974,185
Jan.	1929	3,651,041	1,563,554	1,461,104
Feb.	1928	4,394,561	1,697,498	1,244,812
HIGH PRESSURE INNER TUBES				
Feb.	1929	5,159,171	1,398,156	1,046,042
Jan.	1929	4,734,477	1,540,272	1,800,676
Feb.	1928	5,941,626	1,949,539	1,470,668

New Activities of Foreign Car Makers Cause Increasing Interest in Germany

Intentions of foreign manufacturers in regard to starting or developing operations in Germany are the chief interest of the German automobile world at the present time, according to *European Finance*. The position of foreign manufacturers with plants in Germany is becoming stronger; their share of the total German production is estimated at about 15 per cent, according to figures compiled recently by the Reich Statistical Bureau and quoted in the magazine.

During 1927 foreign assembling plants in Germany turned out 12,100 automobiles of various kinds, against only 1750 during 1926. Imports are also rising. For 1927 they totaled 11,383 cars against 9697 for 1926. Sales have likewise been brisk, reaching in 1927 a total of 86,652 passenger cars, 11,478 motor lorries, and 84,334 motorcycles, compared with 31,909 passenger cars, 5550 lorries, and 47,398 motorcycles for 1926, which was a slight decrease compared with 1925 production, the publication points out.

The aggregate value of this production has not grown at the same rate as the output and the number of workers employed in the industry has fallen from 84,000 in 1925 to 73,000 in 1927, due to the introduction of more efficient methods of production.

The production of automobiles of all kinds has made tremendous strides in Germany in recent years. German manufacturers turned out 38,568 passenger cars in 1925, 31,857 in 1926, and 84,610 in 1927, and it is expected that the final returns for 1928 will show the production for that year to have been well over 100,000. Holland was the best market for the German export trade in automobiles with Austria running a close second, it is said.

Spicer Awards Contract for Manufacturing Unit

TOLEDO, April 16—Rapid expansion of the plant of the Spicer Manufacturing Corp., here, is under way as a result of acquisition of the adjoining plant of the Royal Varnish Co., and award of a contract for construction of an addition to the present plant which will add 175,000 sq. ft. of working space. Approximately $255,000 is being spent on the addition which is to be completed by June 15. The varnish plants adds two and one-half acres to the Spicer holdings and gives it frontage on the Michigan Central and New York Central railroads.

Charles A. Dana, president of the company, here a few days ago for conferences with R. E. Carpenter, vice-president and general manager in charge of the Toledo plant, indicated he was well pleased with operations and that much more of the Spicer manufacturing would be centered in this plant.

General Electric Makes Fuel Gage for Aircraft

SCHENECTADY, N. Y., April 15—A gasoline gage specially adapted for use on aircraft, by reason of its high degree of accuracy, has been developed by J. H. Payne of the Research Laboratory of the General Electric Co. The force which produces the indication is that of the weight of the fuel, which is shown on an electric meter with a scale calibrated to indicate gallons.

The device consists of a small meter container about the size of an ordinary door knob, which is attached to the drain cock at the bottom of the fuel tank and connected to an electric meter in the cockpit panel of the plane.

An outstanding feature of gage is the absence of copper connecting or glass recording tubes, which are liable to freezing or breakage. Except for the indicating meter on the instrument board, there is no movable part.

Bingham Stamping Opens New $100,000 Addition

TOLEDO, April 16—The Bingham Stamping & Tool Co. opened the new $100,000 addition to its plant here yesterday and has planned rapid advancement of its production of stampings for the automobile industry. The plant has been designed with its warehousing in the middle, facilitating quick service to all operating departments.

More than $500,000 of contract work is now awaiting completion, according to officials of the company. This includes work for Nash, Chevrolet and other General Motors units. While its activities are confined to contract work, the company has an engineering staff for the purpose of improving on design and specifications for its customers. Jeremiah Bingham is the president of the firm.

Young Reports Increase

RACINE, WIS., April 15—The Young Radiator Co. reports more orders on hand with heavier shipments during March than in any previous corresponding period in its history. The company's products include several new developments in the cooling field. Officials of the firm state that its business in the current year will be double the satisfactory showing last year.

Graham-Paige Expands

DETROIT, April 13—The Graham-Paige Motors Corp. recently announced a number of new distributors in the South. Since the first of the year, the company's list of foreign distributors has increased from 106 to 119, with dealers growing from 201 to 503. New distributors are Manila, Philippine Islands; San Juan, Porto Rico; Caracas, Venezuela, and Bogota, Colombia.

Battery Makers Announce Speakers for Convention

NEW YORK, April 17—The National Battery Manufacturers' Association has announced that the first day of its spring convention will be devoted to committee meetings while the second will be given over to reports of officers and committees. The event will be held at the Hotel Gibson, Cincinnati, April 24 to 26. William E. Humphrey, member of the Federal Trade Commission, will be the speaker at the annual banquet. His subject will be The Work of the Federal Trade Commission.

Other speakers tentatively announced for the last day and a half include: Markham Flannery, director of Trade Practice Conferences, Federal Trade Commission, who will speak on Trade Practice Conferences; O. J. McClure, founder of the McClure Method of Salesmanship Education, who will speak on Developing the Natural Abilit of Your Salesmen; R. C. Busbey, editor of *India Rubber & Tire Review*, who will speak on The Super-Service Station.

C. S. DeFord, research director of Barrington Associates, who will speak on Militant Business; D. H. Kelly, vice-president of USL Battery Corp., who will speak on Inventory; ana Harry A. Einstein, manager of Trade Association Department, The Credit Clearing House Adjustment Corp., who will speak on How the Credit Clearing House Corporation Serves the N.B.M.A.

Whitney Mfg. Moves Office

HARTFORD, CONN., April 15—The Whitney Mfg. Co., of this city, maker of chains, has moved its Boston office to Room 714, Boston Consolidated Building, 250 Stuart St. G. C. Steil, district manager, is in charge.

India Imports 2223 Units

WASHINGTON, April 18—India imported 1500 automobiles, 536 trucks, and 187 motorcycles during the month of February, according to a report received this week by the Department of Commerce.

Travel Air Sales Increase

NEW YORK, April 13—Travel Air Co. reports net sales for March show an increase over the same month last year of $200,000, making the total well over $300,000. Sales of the company included 60 planes delivered to 26 customers or dealers.

Correction

The illustration of the B. & B. Flow Meter in an advertisement of the Amalgamated Carburetters, Ltd., in the March 16 issue of *Automotive Industries* appeared upside down through an error.

Grand Prize List Increases Rapidly

Chiron and Duray Among Contestants Grooming Cars at Indianapolis

INDIANAPOLIS, April 15 — Thirteen cars are now quartered at the Indianapolis Motor Speedway, several more are expected this week and the management predicts that 40 cars will have arrived prior to the qualification tests for the Grand Prize of America, May 30.

Louis Chiron, of France, 1928 European racing champion, is the most recent to arrive. Following him from New York is a Delage Special, of French make, which he will pilot. The first to enter a car in the seventeenth annual 500-mile event was Cliff Bergere, of Hollywood, who will make his third attempt to win the contest in a Front-Drive Miller. The second entry was a Simplex Special by M. A. Yagle, of Philadelphia. This car will be driven by Ray Keech, former world's speed king, whose record was 207 m.p.h. on the Daytona Beach straightaway in 1928. The car Keech will drive is the handiwork of the late Frank Lockhart.

Leon Duray, who came from the bull pen dirt tracks to the Indianapolis Motor Speedway several years ago, has entered three Packard Cable Specials, one of which he will drive himself. Duray holds the record for the fastest tour of the two and one-half mile brick track here at a speed of 124.018 m.p.h.

Fred and Augie Duesenberg have announced that they will have their entries on the track by May 1. Cliff Durant is to drive a car being completed by Tommy Milton. Harry Hartz, 1926 American automobile champion, who has recovered from injuries sustained at Salem, N. H., in 1927, will be in the race. The youngest to announce his intention of entering the contest is Frank Brisko, of West Allis, Wis., who will drive a Miller Special which already has had a racing career under the guidance of Dr. W. E. Shattuck. A. B. Litz, of DuBois, Pa., known to his companions as "Deacon," will pilot the car in which Louis Meyer won the sixteenth annual Sweepstakes last year.

Charles Haase, who own the car Lou Moore jockeyed into second place last May, is preparing his car for entry but has not selected a driver. Bob McDonough will pilot Dick Dodd's front-wheel drive which Cotton Henning, who was Pete DePaolo's chief aid in 1925, is preparing. Earl Cooper has three cars at the track under the care of Johnny Seymour. Cliff Woodbury's arrival is expected soon. Dave Evans is considering several offers to drive.

Missing from the oval this year will be Norman K. Batten, hero of the 1927 race, and Earl DeVore, veteran, who lost their lives in the sinking of the Vestris.

Skoda Works Erects Factory in Bohemia

WASHINGTON, April 18— A new automobile factory, equipped with modern machinery, has been erected by the Skoda Works in Bohemia, the Department of Commerce learned this week. The machinery was imported from the United States and the factory has a potential annual capacity of 20,000 cars. The chain system of construction will be followed and the plant is expected to begin building four-cylinder cars, to cost about $1,147, within a few months, it was said.

Maccar Has New Truck With 6-Cylinder Engine

SCRANTON, PA., April 13—Maccar Truck Co. is offering a new six-cylinder 1½-ton truck. The weight of the chassis is 4500 lb. and the gross weight rating, including 1500 lb. body allowance, is 9000 lb. The engine develops 55 hp. A four-speed transmission is fitted and the rear axle is a bevel-gear-drive, full-floating Timken design, the bevel pinion being straddle-mounted. A two-piece propeller shaft is used, with three metal universal joints.

The equipment includes dual pneumatic tires at the rear and four-wheel hydraulic brakes. The radiator is supported on a cork pad and the core is secured at three points in a four-piece cast-aluminum shell. The core is of continuous-fin-and-tube construction with a cast-bronze bottom tank.

Three wheelbases are available, 126, 154 and 170 in., to accommodate 7, 10 and 12 ft. bodies respectively. Standard equipment includes armored wiring, speedometer, air cleaner, motometer and tire carrier in addition to the usual items.

Martin Starts Building

BALTIMORE, MD., April 13—The first unit of the Glenn L. Martin Co. airplane factory to be built near Baltimore will be ready for occupancy about Aug. 15. The contract has been awarded to the Hughes-Foulkrod Co., Philadelphia. The unit will represent an expenditure of approximately $1,200,000. Two other units are to be built later, the entire enterprise to be finished in three years. In addition to manufacturing land and seaplanes the company will conduct several other projects, including an aeronautical school.

Griswold Outlook Bright

DETROIT, April 13—The Griswold Motor & Body Co., Detroit, has reported more orders on hand than all of its last year's business combined.

March Deliveries Set G.M. Records

Cars Placed With Consumers Total 205,118 and With Dealers 220,391

NEW YORK, April 16—General Motors dealers delivered to consumers during the month of March 205,118 cars as compared with 183,706 cars in the corresponding month of last year, and with 138,570 cars in the previous month this year, according to announcement made by Alfred P. Sloan, Jr., president.

Deliveries by General Motors Divisions to dealers for the month were 220,391 cars as compared with 197,821 in March of last year, and with 175,148 in February of this year. March figures for both retail sales and for delivery to dealers constitute new records for the corporation, the retail sales being the highest for any March and the deliveries to dealers being the highest in the entire history of the corporation.

Comparative figures for the first three months of the current year and for the corresponding months of last year follow:

	Dealers Sales to Users		Divisions Sales to Dealers	
	1929	1928	1929	1928
Jan.	104,488	107,278	127,580	125,181
Feb.	138,570	132,029	175,148	169,232
Mar.	205,118	183,706	220,391	197,821

Indianapolis Sales Up

INDIANAPOLIS, April 15 — New passenger car deliveries in Marion County, which includes this city, for the first quarter, 1929, showed an increase of 43 per cent over the corresponding period in 1928, while truck sales show a corresponding increase of 150 per cent over last year. Registration shows that 38 per cent of the new car sales were for cash. March passenger car deliveries totaled 2158, against 1067 in February and 1472 in March, 1928.

Show Lacks Sanction

CHICAGO, April 13—Capt. Richard Reid, president of the United Aeronautical Society, with offices in the Leiter Building, Chicago, has announced that the International Aircraft Exhibit will be held in the Coliseum here Sept. 7 to 15 regardless of the recent refusal of the Aeronautical Chamber of Commerce to sanction the event. Capt. Reid indicated that he still hopes to gain the sanction of the Chamber.

Goebel Aviation Opens Office

KANSAS CITY, April 16—The Art C. Goebel Aviation Co., Inc., headed by Col. Goebel, trans-Pacific flier, has opened offices in the Hotel Baltimore until its new building, adjoining the municipal airport, is completed. The company, composed of Kansas City men, is capitalized at $200,000. It plans first to open a flying school. Manufacturing is permitted in its charter.

Stutz and Ford Cars in British Contest

LONDON, April 13—When the entry list closed at single fees on March 30 for the Tourist Trophy race in Ulster (northern Ireland) to be run on the Ards Circuit under the auspices of the Royal Automobile Club on Aug. 1, 21 makes were represented with a total of 56 cars of British, American, French, Italian, Austrian and German manufacture. Entries at double fees will be accepted up to July 15.

The race will cover, as last year, a distance of approximately 400 miles on public roads and will be confined to standard cars offered to the public prior to the publication of the regulations on Jan. 31, 1929, though minor modifications will be permitted. Superchargers will be allowed if they are standard or optional equipment in catalogs. Last year the Trophy was won at 64.06 m.p.h. by a supercharged 1½-liter Lea-Francis (Kaye Don driving) with an Alvis second and an Austro-Daimler third.

The cars already entered include two Stutz and two Fords, the latter being entered by dealers and one of the former by the British concessionaire (Warwick Wright). The Stutz has the largest piston displacement at present (5277 cc.), with two Bentleys next (4398 cc.). The following are the cars now entered by either manufacturers, British concessionaires or private owners:

Alvis, 3; Alfa Romeo, 6; Amilcar, 2; Arrol Aster, 2; Aston Martin, 1; Austin, 5; Austro-Daimler, 1; Bentley, 2; Bugatti, 2; Ford, 2; Frazer Nash, 2; Lagonda, 4; Lea-Francis, 8; Lombard, 1; Marendaz, 1; Mercedes, 1; O. M., 2; Riley, 4; Stutz, 2; Sunbeam, 3; Triumph, 2.

The Alvis cars are the only ones having front-wheel drive.

Patros, in Greece, Enters Bus Market

WASHINGTON, April 18—Between 15 and 30 buses, having from 18 to 24 seats, will be purchased in the near future for use in the City of Patros, Greece, says a cable received this week by the Department of Commerce. The Department is advising American manufacturers to furnish complete specifications and prices to the Mayor of Patros and to send copies of correspondence to the American Consul at Patros.

Keystone Obtains Rights

BRISTOL, PA., April 16—Edgar N. Gott, president of the Keystone Aircraft Corp., has announced that the company has obtained the exclusive rights to manufacture in this country the Short-Calcutta flying boat and other aircraft products of the Short Brothers, of Great Britain. The Bristol plants will be expanded to the extent of about 150,000 sq. ft., Mr. Gott said, and production will be started after engineers of the company have brought one of the craft to this country.

Plan International Conference

WASHINGTON, April 14—With representatives from 45 countries in attendance, the Fifth General Congress of the International Chamber of Commerce will be held in Amsterdam, July 8 to 13. This conference of world business leaders will consider economic conditions which tend to check the steady advancement of international trade.

Tractor Output Set by Allis-Chalmers

MILWAUKEE, April 15—New units of the Allis-Chalmers Mfg. Co., Milwaukee, costing approximately $2,000,000, for expanded and increased tractor production, will be ready to start operations about May 10. A new light tractor has been developed and will be marketed through the recently organized United Tractor & Equipment Co., Chicago.

By July 1 a daily output of 50 of the smaller tractors will have been reached, it is said, with a gradual advance to 100 a day, the capacity. Fifty of the larger tractors are now being built at the main works in West Allis, while the production of the heavy duty tractor, built by the Monarch Tractor Co. at Springfield, Ill., an Allis-Chalmers subsidiary, is also being increased steadily, with the completion of extensive additions.

Radio to Guide Racing Car

LONDON, April 13—P. C. Amhurst Villiers, young English engineer, announces that he has designed a racing automobile to be guided by an invisible beam from a radio transmitter, with the aim of capturing the world's speed record at Daytona Beach, Fla., in 1931. An indicator on the dashboard will show the slightest deviation from the straight path on a white disk. The car is to have eight wheels, all directly driven, will weigh four and one-half tons, with engine installation developing 3000 hp., giving a guaranteed speed of 300 m.p.h. and a maximum of 400 m.p.h., it is explained.

Sharon Operating New Unit

SHARON, PA., April 13—The new hot-rolled strip mill of the Sharon Hoop Co., in this city, consisting of 11 stands, has been placed in operation.

Calendar of Coming Events

SHOWS

Milan, Trucks ..... Apr. 12-27
Jugo-Slavia, Automobiles ..... Apr. 20-28
Budapest Auto Salon ..... May
Melbourne Automobile Show ..... May 2-11
International Aircraft Exhibition, Olympia, London ..... July 16-27
International Aircraft Exhibit, Coliseum, Chicago ..... Sept. 7-15
Paris, Automobiles ..... Oct. 3-13
London, Automobiles ..... Oct. 17-26
Prague, Automobiles ..... Oct. 23-30
Paris, Motorcycles ..... Oct. 23-Nov. 3
M.&E.A. Show, Chicago ..... Nov. 4-9
N.S.P.A. Show and Convention, Detroit ..... Nov. 11-16
Berlin Auto Salon ..... Nov. 14
London, Trucks ..... Nov. 7-16
Paris, Trucks ..... Nov. 14-24
London, Motorcycles ..... Nov. 30-Dec. 7
Brussels Auto Salon ..... Dec. 7

CONVENTIONS

National Battery Manufacturers Association, Cincinnati ..... April 24-26
American Welding Society, Annual Meeting, New York City ..... April 24-26
Chamber of Commerce of U. S., Meeting, Washington, D. C. ..... April 29-May 3
National Safety Congress Meeting, Kansas City ..... April 30-May 2
American Society of Mechanical Engineers, Detroit ..... May 1-3
American Management Association, New York ..... May 6-11
National Safety Congress Meeting, Detroit ..... May 7-9
National Highway Traffic Association, Hotel Stevens, Chicago ..... May 13-15
A.S.M.E. Meeting, Rochester, N. Y. ..... May 13-16
National Hardware Association (Metal Branch) Annual Meeting, Detroit, ... May 16-17
American Gear Manufacturers' Association, Annual Meeting, Hotel Statler, Cleveland ..... May 16-18
A.S.M.E. Aeronautic Meeting, St. Louis, ... May 27-30
American Society Testing Materials, Annual Meeting, Atlantic City, ... June 24-28
American Welding Society, Fall Meeting and Exposition, Cleveland ..... Sept. 9-12
American Institute of Mining and Metallurgical Engineers, Cleveland, ... Sept. 9-12
American Society for Steel Treating, Convention and Exposition, Cleveland ..... Sept. 9-13
A.S.M.E.—Iron and Steel Division—National Meeting, Cleveland ..... Sept. 11-13
Society for Electrical Development, New York City ..... Sept. 13
Eastern States Exposition, Springfield, Mass. ..... Sept. 15-21
National Machine Tool Builders' Association, Cleveland ..... Sept. 30-Oct. 4
National Safety Congress, Annual, Chicago ..... Sept. 30-Oct. 4
World Engineering Congress, Tokio, Japan ..... Oct. 29-Nov. 22

RACES

Akron ..... May 12
Gardner Trophy (Aircraft), St. Louis, ... May 28-30
Indianapolis ..... May 30
Detroit ..... June 9
Altoona, Pa. ..... June 15
Rudge Whitworth Cup, Le Mans, ... June 15-16
Salem, N. H. ..... June 29
French Grand Prix ..... June 30
Akron ..... Aug. 18
National Air Races and Show, Cleveland, ... Aug. 24-Sept. 2
Syracuse ..... Aug. 31
Altoona, Pa. ..... Sept. 2
Cleveland ..... Sept. 15
Salem, N. H. ..... Oct. 12

S. A. E.

Summer Meeting, Saranac Lake ..... June 25-28
Aeronautic Meeting, Cleveland ..... Aug. 26-28
Production Meeting, Cleveland ..... Oct. 2-4